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REPORTS

FROM

COMMISSIONERS:

TWENTY VOLUMES.

—(*18.*)—

NEW YORK INDUSTRIAL EXHIBITION.

Session
31 *January*——12 *August* 1854.

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REPORTS FROM COMMISSIONERS:

1854.

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EIGHTEENTH VOLUME.

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NEW YORK INDUSTRIAL EXHIBITION.

GENERAL REPORT

OF

THE BRITISH COMMISSIONERS.

Presented to the House of Commons by Command of Her Majesty, in pursuance of their Address of February 6, 1854.

[1716]

[74]

LONDON:
PRINTED BY HARRISON AND SON.

RETURN to an Address of the Honourable the House of Commons, dated February 6, 1854;
for—

"Copies of the Reports made to the Foreign Office, or to any other Department, by the Commissioners appointed to attend the Exhibition of Industry in the City of New York."

GENERAL REPORT.

To the Right Honourable the Earl of Clarendon, K.G., G.C.B., Her Majesty's Principal Secretary of State for Foreign Affairs.

My Lord, *London, December* 1, 1853.

IN reporting on the general results of the visit we had the honour to be deputed to pay in the summer of this year to the United States of America, on the occasion of the Industrial Exhibition at New York, it is desirable that your Lordship should be made acquainted with the peculiar position in which the Commission was placed on its arrival in that city, early in June last.

Owing to the still unfinished state of the Exhibition building, we found that its opening had been postponed from June 1st, to July 14th, and there was little probability that the arrangement of the various contributions would even then be in a sufficiently forward state to allow of that examination and scrutiny so necessary for the proper consideration of their merits.

Under these circumstances, and in accordance with the instructions received by us from your Lordship, it was decided, after consideration, that the various localities of the United States in which raw materials were likely to be most abundant, mechanical skill most largely applied, manufacturing industry fairly established, and art and science most perfectly developed, whether educationally or practically, should be first visited as far as the limited time at the disposal of the majority of the members of the Commission would allow.

In order to effect this object with facility and certainty, it was thought advisable to divide the labour as distinctly as possible. Taking the classification of the Great Exhibition of 1851 as a basis, as suggested in our instructions, certain departments were assigned to each member of the Commission, on which a report should be prepared and presented.

In Raw Materials, the report on Class I, Mining, Quarrying, and Mineral productions; also, Maps, Charts, &c., and Philosophical Instruments (Class X.), in connection with the latter, was undertaken by Sir Charles Lyell; whilst the report on Minerals in their economic relations and metallurgical operations, as a portion of Class I.; Class II., Chemical processes and products; Class III., Substances used for Food; Class IV., Vegetable and Animal substances used in Manufactures, including also, Tanneries as a portion of Class XVI., was to be prepared by Professor Wilson, together with a report on Class IX., Agricultural Implements and Machines; Class XXVII., Manufactures in Mineral substances, Cements, &c.; Class XXVIII., Manufactures in Animal and Vegetable substances; Class XXIX., Miscellaneous Manufactures; and also, the progress of Scientific Education in relation to industry.

In machinery, Mr. Joseph Whitworth undertook to report on Class V., Machines for direct use; Class VI., Manufacturing Machines and Tools; Class VII., Civil Engineering; and on the character and action of the Patent Laws, and on the system of Electric Telegraphs so extensively used throughout the United States.

In manufactures, the report on Class XI., Cotton; Class XII., Woollen and Worsted; Class XIII., Silk; Class XIV., Flax and Hemp; and Class XV., Mixed Fabrics; Class XVI., Leather (except Tanneries); Class XVII., Paper, Printing, &c.; Class XVIII., Printed Fabrics; Class XIX., Tapestry, Lace, and Carpets; Class XX., Clothing; Class XXI., Cutlery and Edge Tools; Class XXII., Iron and General Hardware; Class XXIII., Precious Metals, Jewellery, &c.; Class XXIV., Glass; Class XXV., Ceramic Manufactures; Class XXVI., Decorative Furniture; and on the position of Art Education as applied to Manufactures and the Copyright of Designs, was undertaken by Mr. George Wallis.

The report on the section of the Fine Arts was assigned to Lord Ellesmere.

Mr. Dilke undertook to obtain an account of the building in which the Exhibition was to be held, and he also agreed to attend to the collection of Trade Circulars and Patent Office Reports, which your Lordship in your instructions particularly specified. Mr. Dilke further undertook to observe whether any new inventions, exhibited in Classes VIII. and X., not embraced in the department of Sir Charles Lyell, Mr. Wallis, Mr. Whitworth, and Professor Wilson, were likely to be of interest or value in England. Unfortunately, for some weeks after his arrival, the arrangements in the building were so incomplete that it was considered advisable that the Commission should visit other parts of the Union, and Mr. Dilke proceeded to the Western States. On his return he found a communication awaiting his arrival from the medical attendant of his family, desiring his return by the first packet, on account of the serious illness of Mrs. Dilke, which illness terminated fatally soon after he reached this country. Mr. Dilke's report will, therefore, necessarily be very brief, as he quitted America before the completion of the arrangements within the building, and when he had seen but a small portion of the United States. Before leaving he was so fortunate as to be able to arrange with Mr. W. Antrobus Holwell, the Commissioner from Canada, to send him notice of any novelties which might be exhibited in Classes VIII. and X. For any account, therefore, which may appear in Mr. Dilke's special report in reference to those classes, he will be indebted to the kindness of Mr. Holwell.

After examining such branches of industry in their respective localities as time would permit, prior to the date fixed for the opening of the Exhibition, the Commission re-assembled at New York, and attended the inauguration on the 14th July, on which occasion the President of the United States and several of the Cabinet Ministers were present.

The continued incompleteness of the Exhibition after the day of opening, suggested the importance of finishing the examination of the various departments assigned to each member of the Commission, as far as possible in their respective centres.

The construction of a large room destined for the reception of mineral and mining products, and of geographical, geological, and other maps and charts, was still in progress when Sir Charles Lyell's engagements required his return to England, in August. There was then no prospect of the display of the articles belonging to this department until the end of September, or beginning of October. Sir Charles, therefore, visited different cities in various States, from which contributions to the Exhibition were expected, and inspected at Washington the Coast Survey Department, presided over by Professor Bache, and the Observatory in charge of Lieut. Maury, U.S.N., in both of which establishments he saw a large assemblage of maps and charts, to which he has referred in his report. He was also shown in various public and private collections, in several of the Eastern States, specimens of minerals, ores, and other raw produce, about to be sent to New York. Sir Charles also availed himself of the assistance of Professor Benjamin Silliman, to whom the classification of objects in Class I. had been assigned in the New York Exhibition, to examine such contributions as had been already received, and which were stored away in parts of the building already roofed in. From these and other sources a rough draft of a report was drawn up, and placed in the hands of Mr. James Hall, geological surveyor of the State of New York; a gentleman to whom the scientific world is indebted for a geological map of part of New York, and several excellent surveys, besides two volumes on the palæontology of the older rocks of North America,—works of the highest merit. Mr. Hall undertook the task of supplying Sir Charles with notes of the various articles appertaining to Class I., after they should have been arranged and finally displayed, a task which was accomplished in the course of October. At that period the Exhibition afforded a satisfactory illustration of the economical resources of many large sections of the Union, although the productive powers of other regions were still very inadequately represented.

The interval previous to the opening of the Exhibition afforded Professor Wilson an opportunity of inspecting several of the more important manufacturing processes in operation in their respective localities, and also of visiting the coal and iron-making districts of Pennsylvania and Maryland; at the same time he availed himself of the opportunity to attend the trials of agricultural harvesting machines, which were at that time taking place in some of the rural districts through which he passed. Subsequently, owing to the annual meetings of the different State agricultural societies not being held until September and October, and the unfinished state of that portion of the building destined for the arrangement of the Mineral department, it was considered desirable that Professor Wilson should remain in the States some weeks longer than he had contemplated, to enable him to fulfil the special duties which had been assigned to him. He, therefore, from time to time prosecuted his examinations in the building as the several classes were completed, and occupied the spare time at his disposal in visiting the principal manufacturing and producing districts of the Western and North Western States, besides those in the more immediate vicinity of New York. In company with Mr. Dilke he attended the meeting of the American Association for the Advancement of Science, held at Cleveland, Ohio; and subsequently, at the special request of the Boards of Agriculture of Canada, East and West, he attended the great Provincial Meetings, held at Montreal and at Hamilton respectively. On his return, through the kindness and assistance of Professor B. Silliman, he had every facility afforded him for examining the fine collection of mineral and metallurgical products under his direction, and having completed as far as was possible the duties he had undertaken, he took his departure from the States by the steamer of the 19th October.

That portion of the Exhibition building in which machinery in motion was intended to be placed, was still unfinished at the period at which Mr. Whitworth had to leave for England; and in the department of Manufactures, the non-arrival or non-arrangement of many important contributions prevented that full and complete examination which had been undertaken by Mr. Wallis. Both, however, have extensively examined the productions in their respective departments in the various establishments which they visited, either before or after the opening of the Exhibition, and upon these and such contributions as were displayed at the time of their departure from New York, on the 10th of August, their reports will be founded.

The Exhibition afforded us no sufficient materials for a judgment of the condition of the Arts of Painting or Sculpture in the United States. A gallery of considerable extent, for the reception of pictures, engrafted on the original design of the building, was still only in process of construction at the period of our departure, and no specimens of sculpture had yet reached the main building which could enable us to certify that such artists as Messrs. Power and Craufurd were following out their already distinguished career, or meeting with competitors among their countrymen. We may be allowed, however, to express an opinion, founded on observations too casual and limited to allow us to particularize individual masters, that the Art of Landscape Painting bids fair to flourish in North America. In a newly settled country, as regards the works of man, the elements of that which common consent denominates the picturesque, must necessarily be in great measure deficient. The aspect of nature, however, in North America has peculiarities of its own, in respect alike of form, of colour, and atmospheric effects, which can hardly fail to attract genius to their pictorial representation, and would justify and reward its highest efforts. We venture to predict that several of the artists whose pencils are already employed on the scenery of their native country, will do justice to its claims upon Art, and establish a national school of landscape of a high order.

In referring to the delay in the opening and completion of the Exhibition at New York, it is but justice to those who had undertaken its management to state that the inclemency of the last winter, the great demand for workmen in the building trades, the novelty of construction in certain portions of the building, and the want of any previous experience in a work of such magnitude, may be considered as an excuse for the delay which took place; and the Commission cannot suffer this circumstance, however much to be regretted, to prevent the expression of the high sense entertained by its members of the courtesy, kindness, and ever-ready attention paid to them alike in their public and private capacity, by all connected even in the most remote degree with the Exhibition. Indeed this courtesy, attention, and anxiety to assist the purposes for which each special locality in various parts of the United States was visited, —the promptness with which all reasonable inquiries were answered,—and the desire to promote, to the fullest extent, the objects of the Commission,—characterised all classes of Americans, thus rendering an otherwise difficult and laborious task comparatively easy and agreeable.

In its general character the Exhibition at New York may be said to be successful. The lessons conveyed in the contributions from Europe cannot, we believe, fail to exercise a beneficial influence over the taste, skill, and industry of the United States.

The attention of the Commission was of course chiefly confined to the contributions of the Americans themselves, and in certain departments the industry of the various States was fairly represented, whilst in others there was a deficiency much to be regretted, more especially in the section of Raw Materials. But, when it is considered that the space assigned to the United States amounted but to one-third part of the whole building, and that this space does not greatly exceed that originally assigned to the contributions from America in the Great Exhibition of 1851, the impossibility of illustrating the industrial resources of so extended a territory as that now comprised within the limits of the Federal Union, becomes self-evident. There can be little doubt, then, that in nearly all essential points the Exhibition will prove to the intelligent and industrious artisans and enterprising manufacturers of America, much more of an instructor in what has to be done, than an expositor of what has been done by them, for the latter can be alone fairly judged of in the manufactories.

Intelligent, from the practical influence of that early education which is alike afforded to all, and indeed made almost imperative on all, either by an enlightened public opinion or legal enactment,—ingenious, industrious, energetic, and painstaking as the producing classes of so busy a community must necessarily be, where popular education is made subservient alike to individual intelligence and natural aptitude for manufactures, with a ready appreciation of all really useful inventions and improvements, great original power, and immense activity,—it will be wonderful indeed if out of such a display of European art and science, skill and industry, the people of the United States do not gain in no ordinary degree a large amount of valuable information, and thus receive a great stimulant to their already well-established manufacturing systems, and valuable hints towards the commencement of others.

We have in conclusion to state that the special reports undertaken, as already stated, by the individual members of the Commission, to whom the examination of the respective departments was assigned, are now in a forward state of preparation, and that they will be submitted to your Lordship at as early a date as their completion will permit.

We have, &c.

(Signed) EGERTON ELLESMERE.
CHAS. LYELL.
C. WENTWORTH DILKE.
GEO. WALLIS.
JOSEPH WHITWORTH.
JOHN WILSON.

NEW YORK INDUSTRIAL EXHIBITION.

General Report.

Presented to the House of Commons by command of Her Majesty, in pursuance of their Address of February 6, 1854.

LONDON:
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NEW YORK INDUSTRIAL EXHIBITION.

SPECIAL REPORT

OF

MR. GEORGE WALLIS.

Presented to the House of Commons by Command of Her Majesty, in pursuance of their Address of February 6, 1854.

[1717]

[74]

LONDON:
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RETURN to an Address of the Honourable the House of Commons, dated February 6, 1854;

for—

"Copies of the Reports made to the Foreign Office, or to any other Department, by the Commissioners appointed to attend the Exhibition of Industry in the City of New York."

MR. GEORGE WALLIS'S SPECIAL REPORT.

REPORT ON MANUFACTURES.

- Class XI. Cotton.
- Class XII. Woollen and Worsted.
- Class XIII. Silk.
- Class XIV. Flax and Hemp.
- Class XV. Mixed Fabrics.
- Class XVI. Leather (except Tanneries).
- Class XVII. Paper, Printing, &c.
- Class XVIII. Printed Fabrics.
- Class XIX. Carpets, &c.
- Class XX. Clothing.
- Class XXI. Cutlery and Edge Tools.
- Class XXII. Iron and General Hardware.
- Class XXIII. Works in Gold and Silver, Jewellery, and their Imitations.
- Class XXIV. Glass.
- Class XXV. Ceramic Manufactures.
- Class XXVI. Decorative Furniture.
- Copyright of Designs.
- The position of Art-Education, as applied to Manufactures.

I HAVE now the honour, as one of the Commissioners appointed to visit, during the summer of this year, the Industrial Exhibition at New York, and the various seats of manufacture in the United States of America, to submit my report on those departments of manufacturing industry, the examination of which was confided to me.

Introduction.

In thus reporting upon the growth and present development of those branches of manufactures to which my attention was specially directed, I have thought it advisable rather to treat of them in their broader features, as shown in the localities in which they are carried on, than in their individual manifestations as displayed in the Exhibition at New York. The classification there adopted has, however, been preserved, since it is identical, in all essential points, with that of the Great Exhibition of 1851, to which attention was directed in the instructions given to the Commission.

Avoiding individual criticism as much as the proper illustration of the present position of American industry would permit, I have sought rather to test the results of transatlantic skill by its own aims, and the peculiar requirements of a people whose wants it is its honourable ambition to supply, than to institute unfair comparisons, which could only lead to conclusions of no practical value. For it could not be reasonably expected that any great amount of originality would be the result of the first efforts of a people, however ingenious, whose experience in many of those branches of manufacture which in Europe have claimed the exclusive attention of skilled artizans for ages, does not date so far back as a single generation.

Manufactures, as a *result*, must, however, be carefully separated from machinery, as a *means*; since, in the latter, originality of conception, construction, and application is one of the most remarkable features in the progress of industry in the United States, but this Report deals with manufactures only and originality was not likely to result where imitation of European productions has alone been the aim of the manufacturer and the artizan. The requirements of the markets to be supplied, the competition and comparison of American products with those of England, France, and Germany, and the fact that the very workmen, by whose agency alone a commencement could be made, were Europeans, bringing with them the traditions of the workshops and the conventional types of the old world,—all tend rather to repress than to encourage any departure from the stock forms of the more ordinary and useful productions so constantly in demand, and which the absurd prejudices or vicious cupidity of the mercantile classes often compels the manufacturer not only to imitate, but absolutely to brand with the name of his foreign rival. This is equally unfair to the native as to the foreign producer, since the former is deprived of the credit and reputation due to him for his ingenuity, whilst the latter is deprived of his market, not by fair and honest competition and comparison, but by an imitation of his wares. A difficulty was thus created by those who ought rather to have encouraged than sought to repress the rising energies and aspiring ingenuity of their own countrymen, yet such is one of the processes through which American industry has had to pass in many of its branches. Happily this state of things has been much modified recently. Nor should the various disadvantages under which the skilled workman is necessarily placed be overlooked, since in a new country he becomes almost entirely dependent upon his own resources and ingenuity alone for the supply of those means and materials which, in a more advanced state of manufacturing progress, the division of labour abundantly aids him in procuring. The mutual dependence of one branch of manufacture upon another is so wide-spread and universal that, at first sight, the difficulty in commencing some of them appears so great as to convey the impression that it is insurmountable. Certainly the one thing which, more than any other, strikes the visitor to the seats of industrial skill in the United States, is the ingenuity, the indomitable energy and perseverance displayed in overcoming the early difficulties which must have stood in the way of anything like successful progress at the outset. It is not, therefore, a matter of surprise that many skilled artizans have, from time to time, returned to Europe, after an attempt to establish a manufacture, since the embarrassments arising out of almost unaided exertions and an isolated position, were too great to allow them to do justice to themselves, or to those employers whose spirit and enterprise might have induced them to embark capital in such undertakings. The pecuniary loss of the latter has frequently been inevitable, and the early history of *nine-tenths* of the various branches of manufacture now flourishing in the United States, and amply repaying their present proprietors, is that of ruin, or of enormous sacrifices on the part of those who had the hardihood to become pioneers in those arts which now promise to become, at no distant period, of vital importance to the well-being of millions of industrious men and women. Again, even to the present time, the isolation of manufactories in places at such a distance from each other that mutual aid is almost impossible, renders it imperative that each should be complete within itself, and that everything connected with its operations should be either manufactured on the premises, or kept in stock to such an extent as shall ensure a continuous supply. Thus, both the self-assistance and the laying in a stock of materials is carried to a much greater extent than the majority of English manufacturers would credit. This gives a great peculiarity to the manufacturing system of the States, so far as at present developed, and many of the manufacturers of Birmingham and Sheffield would soon close their doors if they had to furnish themselves with all the partially prepared materials for which they depend upon those whose business it is to manufacture them. Yet such is the position of large numbers of the most successful houses in the United States, and the difficulty is met with a tact and ingenuity of no ordinary kind. There can be no doubt, too, that this necessity for self-supply has been the means of originating many ingenious machines, for which the Americans have so deserved a reputation, as applicable to the manufacture of small articles, or portions of more complicated productions.

Foreign competition.

Early difficulties in establishing manufactures.

Automa machine.

Thus the very difficulty in procuring human labour, more especially when properly skilled and disciplined, which would assuredly be the greatest drawback to success, appears to have stimulated the invention of the few workers whose energies and skill were engaged in the early development of manufactures; and to this very want of human skill, and the absolute necessity for supplying it, may be attributed the extraordinary ingenuity displayed in many of those labour-saving machines, whose automatic action so completely supplies the place of the more abundant hand labour of older manufacturing countries.

Effects of education.

The successful application of mechanical means to one manufacture has been, as a matter of course, stimulative of their application to another, however different, and the adaptative versatility of an educated people was never more fully displayed than in the constant effort to supply their greatest want—that of skilled labour—by applications of mechanical powers to that object. Nor can the most superficial observer fail to he impressed with the advantages thus derived from the long and well-directed attention paid to the education of the whole people by the public school systems of the New England States and of the State of Pennsylvania. Here, where sound and systematic education has been longest and, in all probability, most perfectly carried out, the greatest manufacturing developments are to be found, and here it is also where the greatest portion of the skilled workmen of the United States are educated, alike in the simplest elements of knowledge, as in the most skilful application of their ingenuity to the useful arts and the manufacturing industry of their country, and from whence they are spread over the vast territories of the Union, becoming the originators, directors, and, ultimately, the proprietors of establishments which would do no discredit to the manufacturing States of Europe.

American workmen.

As there is no apprenticeship system, properly so called, the more useful the youth engaged in any industrial pursuit becomes to his employer, the more profitable it is for himself. Bringing a mind prepared by thorough school discipline, and educated up to a far higher standard than those of a much superior social grade in society in the Old World, the American working boy developes rapidly into the skilled artizan, and having once mastered one part of his business, he is never content until he has mastered all. Doing *one* mechanical operation well, and only that one, does not satisfy him or his employer. He is ambitious to do something more than a set task, and, therefore, he must learn all. The second part of his trade he is allowed to learn as a reward for becoming master of the first, and so on to the end, if he may be said ever to arrive at *that*. The restless activity of mind and body—the anxiety to improve his own department of industry—the facts constantly before him of ingenious men who have solved economic and mechanical problems to their own profit and elevation, are all stimulative and encouraging; and it may be said that there is not a working boy of average ability in the New England States, at least, who has not an idea of some mechanical invention or improvement in manufactures, by which, in good time, he hopes to better his position, or rise to fortune and social distinction.

Sub-division of labour.

At first sight, these characteristics do not appear to be conducive to that orderly, and, still less, to that economic working of a manufacturing system, which shall supply the daily increasing wants of a country like the United States. Nor are they so, but for that element of educated intelligence of which they form only one phase. On this intelligent understanding of the true position of things, and the requirements of the social system around him, the skilled workman rests his position. In an old country, with conventional arrangements, in which the minute sub-division of labour grows rather out of the ignorance of the workers, than out of their intelligence, since the great mass are only fitted to do one thing well, the great fact of such sub-division must ever be imperatively insisted upon. But, it must be remembered that in the United States, the wants and increasing demands of a new country have to be dealt with, not the least of which is, that very skilled labour which the varied occupation of each individual artizan is intended to supply. Nor does this knowledge of two or three departments of one trade, or even the pursuit of several trades by one individual, interfere so much with the systematic division of labour as may be supposed. In most instances the change of employment is only made at convenient periods, or as a relief to the workman from the monotony of always doing one thing. This is a mechanical process which an uneducated man may prefer, but which, in a majority of cases, the intelligent workman would willingly be spared if it was not compulsory through the arrangements of the system under which he labours; or if change of employment did not endanger the amount of his earnings. There is, however, one drawback to this otherwise successful violation of the economic law of sub-division. It is unfavourable to that perfect skill of hand, and marvellous accuracy, which is always to be found associated with the constant direction of the attention and practice of the workman to one thing; and this is often very apparent in most of the manufactured articles of America. They lack that perfect finish and completeness of appearance which characterize similar productions of Europe. It is true that the practised eye alone can detect the difference, but it is not the less to be noted on that account. Probably, a more extended experience and thorough practice will do much towards remedying this defect, which may be said to exist in all early efforts either of individuals or of nations.

Social position of the artizan classes.

Hours of labour.

Slave labour against free labour.

The position of the artizan classes of the United States has been the subject of so much disquisition, and it is generally understood to be satisfactory, alike educationally and socially, that it needs no comment here. It may be requisite, however, in considering the position and development of the different branches of manufactures, to occasionally make reference to the relations in which the producing classes stand; the hours of labour and rate of remuneration, as compared with the same classes in Europe. It will be sufficient, therefore, to state here the general fact, upon which there exists some misapprehension in England, that, though the rate of remuneration is relatively higher, the number of hours constituting a day's work, especially in factory labour, is much greater; and that this excess in the hours of work, obtains generally in every industrial occupation. Employment, however, is always plentiful: labour, especially skilled labour, ever in demand. Occasionally, in some of the middle States, complaints are made of extreme home competition, and that attempts are being made to bring slave labour to bear upon manufactures, to the reduction of prices, and, consequently, of the remuneration of free labour. But, the prevailing idea is, that slave labour can never by any possibility be made to compete, or to pay in comparison with free labour. This is held equally by the opponents and advocates of the institution of slavery as it at present exists, and it is only mentioned here in order that it might not be supposed that a question of so much importance in its social, as in its economic aspect, was overlooked; since, I have no inducement or inclination to meddle with so fruitful a source of misunderstanding, even in its industrial aspect.

Manufacturing corporations.
Laws of partnership.

The laws of partnership of the United States, which encourage the formation of manufacturing companies, with limited responsibility in the non-managing shareholders,* has led to a much greater development of the industrial resources and skill of the country, than, in its circumstances, could have resulted under mere private enterprise for many years to come. It must, however, be evident to every person who carefully examines the joint-stock system of manufactures, as it now exists, that it is by no means favourable to the ultimate and permanent success of manufacturing establishments generally, and, though there are many highly gratifying and honourable exceptions, those are the best managed where there are the fewest proprietors, and, consequently, the smallest number of individual interests to consult. The machinery of a board of managers, though less cumbrous than in England, is, even in its best form, too slow in its action for the proper care of interests and the execution of prompt and energetic dealings, so essential to success in manufacturing and commercial transactions. And, though the management and responsibility of these concerns is usually narrowed to the limits of safe responsible power, the promptitude of the individual mind of a single proprietor, or even of two or three, who feel that they alone can decide, as they alone are involved in the issue, is wanting.

In stating this, however, it must not be understood as any condemnation of the law of partnership, as it exists in a variety of forms in the different States of the American Union, tending, as it does, to encourage enterprise and skill in combination with limited capital, and affording means of investment of great value to a large portion of the community; but simply as placing the question of management and the organization of industry upon its true basis—that of a distinct interest, combined with full powers and complete responsibility.

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* An erroneous impression appears to exist in England as to the extent of the responsibility of all shareholders or partners in the joint-stock manufacturing companies of the United States. The agent or secretary, manager, treasurer, and directors, being also shareholders, are held by the law fully responsible, to the extent of their means, for the results of the management entrusted to and undertaken by them. The limited responsibility is therefore wisely confined to the non-managing shareholders, the latter being liable only for the amount of their subscription for shares. G. W.

As a means of developing the individual powers and natural resources of a new country, encouraging self-reliance, promoting economical habits by affording opportunities for the safe and profitable investment of small amounts of realised capital in the hands of the industrious classes, the value and importance of a limited responsibility in the law of partnership cannot be overlooked or over-rated. To it the manufactures of America owe much of their present, as, without doubt, they will of their future prosperity and success.

Character of the Report.

Before proceeding to the consideration of the various classes of manufactures which it is intended to embody in this report, it is essential most distinctly to explain, that such report is not intended as a complete exposition of the manufacturing industry of the United States of America. Neither time nor opportunity would permit of such a complete examination of the various localities in which manufactures are carried on, and though the distance travelled over in various States during the comparatively short period of eleven weeks, which my duties in England would permit me to devote to the objects of the Commission, apart from the sea-voyage, was upwards of 5,000 miles, and embraced the States of Massachusetts, Connecticut, New Hampshire, Rhode Island, New York, New Jersey, Pennsylvania, Maryland, the district of Columbia, Eastern Virginia, Kentucky, and Ohio, it must be evident that a full and minute examination of the industry of these States alone would have occupied a much longer period than I could possibly under the circumstances devote to them. The manufactories visited were those which appeared to be most likely to offer a fair type of others which could not be included, or those which I was well assured would present the most complete development of their special branches of trade.

States visited.

Delay in the opening of the Exhibition at New York.

The circumstances of the delay in the opening of the Exhibition at New York, were favourable to a more extended visitation of the leading localities than might otherwise have been undertaken. The continued incompletness, however, of the arrangements of the Exhibition at the time of my departure for England, on the 10th of August last, prevented so complete an examination of the contributions in their respective classes as could have been wished.

In almost every instance, the basis of this report is the result of careful personal examination and inquiry. In one or two instances, however, where the distance to be travelled over was too great, or the amount of development likely to present itself was not likely to compensate for the time occupied in the journey, I deemed it advisable to communicate by letter with some responsible person, and where the information received in reply was considered of sufficient importance to be embodied in this report, my authority is given with it.

It is possible that some of the contrivances and processes described may be mere modifications, or exact imitations of processes recently introduced into use in England. If so, this must be ascribed to the fact, that no individual could possibly be acquainted with every recent improvement in even one branch of manufacture, and, as the work here undertaken involves so wide a range, it would have been an act of great presumption to have decided amongst the many industrial expedients which presented themselves, as to their originality, or their exclusive application in the United States. I have, therefore, preferred mentioning such as were new to myself, but which may be less novel to others, rather than run the risk of neglecting any really useful or ingenious process from a puerile fear of describing something already known to those interested in any special manufacture.

No fact appears more certain than that the manufacturers of the United States take especial care to be well informed on all European improvements, either in machinery or in processes; and, as traditional methods have little hold upon the American, as compared with the English artizan, processes holding out the least promise of improvement are quickly tested, and, if found worthy, are adopted either in their integrity or with such modifications as the ingenuity or wants of those applying them may suggest or require.

European artizans employed.

The extent to which European artizans, especially Englishmen, are employed in the manufactories visited, was a point I deemed it worth while to inquire into. The numbers will be found indicated under the heads of the several branches of trade, in connection with the notices of the manufactories in which they are employed.

English workmen.

There are, however, very few Englishmen compared with what I expected to find, or are generally supposed to be engaged in the industrial establishments of the United States. The hours of labour, as already indicated, are too long for most of those who are induced to emigrate, since they usually seek for a less demand upon their energies than they are subjected to in England, as well as a higher rate of payment, and it is no uncommon thing for the really skilled and steady artizan, who can earn a sufficient livelihood at home, to return after a brief trial in the United States. The sudden variations in the temperature, too, and the extremes of heat in summer and cold in winter, are very trying to the majority of English workmen, and if, as is too often the case, they are at all given to intemperate habits, these are aggravated by the climate, and disease and death cuts them off much more rapidly than is, I fear, generally acknowledged. It may not be uninteresting, however, to state, that some of the best and most intelligent artizans, as also some of the most successful manufacturers in the United States, are the sons of Englishmen, taken early in life to their adopted country, acclimated by habit, rendered intelligent by the education received in public schools; their ingenuity and industry stimulated and encouraged by the character of the institutions around them, they often present remarkable instances of self-elevation; and, whilst in an earnest love of their adopted country, they may be said to be more American than the Americans, their secondary pride, if I may use the term, is, that their fathers were Englishmen.

German workmen.

German workmen are largely employed in many departments of industry, and being generally an intelligent and orderly class of men, are highly esteemed. Hence, in some branches of the metal trades, the modes of manufacture are often more German than English, although, perhaps, originally established upon the methods of the latter. Still, taking into consideration the whole number of English, German, and French employed in the United States, I believe it would be found that eight-tenths of the artizan class are Americans, or the children of Europeans, rather than Europeans themselves.

I now proceed to the consideration of the sixteen classes of manufactures which it was my duty to examine and report upon, under their respective heads.

CLASS XI.

COTTON.

Cotton manufactures.

The cotton manufactures of the United States appear to hold the first position in the industrial productions of that country, alike as regards extent and value; and, although their operations are chiefly centralised in New England and Pennsylvania, yet there are only seven of the thirty-one States of the Federal Union in which the spinning or manufacture of cotton is not carried on. These are Louisianna, Texas, Michigan, Illinois, Iowa, Wisconsin, and California. In all the other States, including the district of Columbia, establishments of a more or less important character are to be found. By a return printed in a report of the Superintendent of the Census of the United States for 1850, 1054 establishments for the manufacture of cotton goods are stated to be in operation, consuming 641,240 bales of cotton, and manufacturing goods to the value of $43,207,555, or about £1,000,000 sterling per annum. Of these establishments 564 are in the New England States alone; 213 of them being in Massachusetts, 158 in Rhode Island, and 128 in Connecticut: 65 only are to be found in the States of Maine, Vermont, and New Hampshire; but the 44 mills returned as being in the last named State manufacture nearly as much in quantity and value as the 286 establishments of the two States of Rhode Island and Connecticut. Of the 530 mills scattered over the remaining eighteen States, Pennsylvania has 208. Of the Southern States, Georgia and

Tennessee have the largest number of establishments, those in the former being returned as 35, and in the latter 33; but, from information received in Virginia, there is no doubt the number of mills in Georgia has increased considerably since 1850.

Number of persons employed in cotton manufactures.

The number of persons employed in the cotton manufactures of the whole of the States was 33,150 males, and 59,136 females.

The New England establishments are conducted upon a similar principle to the largest cotton factories of Great Britain, and spinning and manufacturing are carried on as one concern. This, however, is not the characteristic of the mills in the above States, as they are, in many instances, employed in spinning only, and in Pennsylvania, Georgia, and Tennessee, yarns are produced chiefly for the purposes of domestic manufacture by hand, which still obtains in many parts of the older States of the Union. Thus whilst in Pennsylvania the capital invested amounts but to about one-seventh of that of Massachusetts, the quantity of cotton consumed is one-fifth, the value of raw material not quite one-fourth, the number of operatives (male and female) one-fourth, the value rather more than one-fourth, the number of pounds of yarn spun and sold as yarn is above *thirty* times greater in Pennsylvania than in Massachusetts. This, to a certain extent, gives a key to the difference in the modes of manufacture in the two States, and illustrates the distinction already alluded to. There can be no doubt, however, that domestic weaving is gradually giving way, and those manufacturers, especially in Pennsylvania, who formerly did a prosperous business as spinners only, now find that the Eastern States supply the piece goods at a rate so little above the cost of the yarn, that it is not worth the while of the farmer to continue this primitive custom of weaving his own cloth. Thus the domestic loom is fast following the spinning-wheel of the early settlers, and those manufacturers who until recently have spun yarn only, are gradually introducing the power-loom as the only means of sustaining their position in the market. This was illustrated by a visit to the "Eagle Cotton Mill," Pittsburg, Pennsylvania. Formerly the proprietors spun yarn alone, and did a successful trade, but, by a return with which they favoured me, I find that in six establishments under their direction they had introduced already 540 looms to the 26,000 spindles, and were manufacturing sheetings at the rate of 6,000,000 yards per annum, together with twilled cotton bags, batting, and yarns, from 5*s.* to 18*s.*; and this, in order to make the latter pay by consuming the surplus yarns themselves. In the Penn Cotton Mill, Pittsburg, the more modern system had become the rule of the establishment, and with 7,000 spindles and 207 looms, 2,730,000 yards of shirtings were produced annually, besides 240,000 lbs. weight of coloured yarns for carpet warps and cotton rope.

Cotton mills, Pittsburg, Pennsylvania.

Cotton mills, Richmond, Virginia.

At two establishments at Richmond, Virginia, the consumption of the yarn, in the manufacture of piece goods, was also the rule, and this being the extent of my journey southward, it became a matter of interest to inquire as to the progress of the cotton manufacture in the cotton-growing States. Georgia, Tennessee, and North Carolina were quoted as those in which the greatest progress had been made; whilst Virginia, South Carolina, and Alabama, were the next. In Tennessee spinning would appear to be the rule, and manufacturing the exception. In Georgia and North Carolina equal attention is paid to both; whilst in Virginia, South Carolina, and Alabama the manufacture of piece goods is decidedly more extensively carried on than spinning only. Slave labour is said to be largely used, with free whites as overseers and instructors.

Cotton manufacture in the Southern States.

Slave labour in cotton mills.

In the two establishments above named free white labour alone is employed. The males are heads of departments, machinists, dressers, &c., and the females are spinners and weavers. The latter are chiefly adults, though children from twelve to fifteen are employed. The average hours of work here are twelve, but vary a little with the season. *Very full time* being the rule. At least such is the statement of the manager of the James' River Company's Mill. This establishment, as also the Manchester Cotton Company's Mill, is at Manchester, Chesterfield county, Virginia, and situated opposite to Richmond, on the James river, from the falls on which the water power used for driving the machinery is derived. The James River Mill produces a large weight of work for the extent of its machinery. The goods manufactured are coarse cottons, and average about 2½ yards to the pound; shirtings, 28 inches wide (Osnaburgs), summer pantaloons for slaves, and bagging for export to the Brazils for sugar-bags, running about 3 yards to the pound. Bagging of a

James River Mill, Richmond, Virginia.

Manchester Company, Richmond, Virginia.

Patent "speeder."

lighter character, for grain, and 36 inch Osnaburgs, two yards to the pound, are also produced. The Manchester Company manufacture sheetings, shirtings, and yarns, and employ about 325 operatives, the children being of the same average age as at the James River Mill. The manager, Mr. Whitehead, is an Englishman, as is also the chief mechanic. The former has just perfected a patent "speeder," of which the latter expressed a very high opinion. Its advantages are a greater speed, a more even roving, and a bobbin of any desirable size, which never becomes spongy in the winding.

Cotton manufactures in Maryland.

The small development of the cotton manufacture in the States of Indiana, Mississippi, and Arkansas, or even those of Ohio and Kentucky, required no special inquiry. In Maryland, however, there were twenty-four establishments in 1850, chiefly engaged in manufacturing piece goods, such as drillings, sheetings, ducks, Osnaburgs, and bagging. The yarns produced for domestic purposes bear but a small proportion to those manufactured into cloth, and these are chiefly sold within the State for the home weaving of mixed fabrics of wool and cotton, forming coarse linseys. The wool is mostly spun by hand in the farm houses, and the fabrics when made are entirely for domestic use. In Maryland, too, bleaching is carried on to a considerable extent.

Cotton manufactures of the New England States.

Having thus endeavoured to illustrate the position of the cotton manufacture in the form in which it has developed itself in the South, and, so far as circumstances would permit of an inquiry, in the Middle States, bordering on the west; the manufacturing system, as manifested in the cotton trade of New England, demands consideration. If the illustrations given show the early progress and position of this manufacture in the United States, so far as daily recurring improvements and ever increasing wants have permitted it to remain in its original form, the manufacturing towns of Lowell, Manchester, and Lawrence strikingly demonstrate the results of the energy and enterprise of the manufacturers of New England.

At Lowell, Massachusetts, the cotton manufacture has been developed in a form which has been a theme for many writers on the economy and social bearings of the factory system; and the plans so successfully put into operation here, and carried on since 1822, have led to the erection of large establishments with their attendant boarding-houses, at Manchester, New Hampshire, and more recently at Lawrence, Massachusetts; whilst a commencement has been made at Holyoke, in the same State, by the Hadley Falls Company, which promises a result of a more extraordinary character than anything yet achieved in the United States. Each of these localities present features peculiar to themselves, and, besides the manufacture of cotton goods, other branches of production in textile fabrics are carried on.

Origin of Lowell, Massachusetts.

The falls of the Pawtucket on the Merrimack river, and the Pawtucket Canal, which had previously been used only for the purposes of navigation, and connecting the river above and below the falls by means of locks, presented to the original projectors of Lowell a site for the solution of an important problem, not only in American industry, but to a great extent in that of Europe itself. This was the combination of great natural advantages with a large and well-directed capital, resulting in extensive and systematic operations for the realization of a legitimate profit; whilst the social position of the operative classes was sedulously cared for, and their moral and intellectual elevation promoted and secured. The example has not been lost, even in Europe, and the possibilities of the manufacturing system of a country being carried on without deterioration, but, on the contrary, to the consolidation and promotion of the best interests of the labouring classes, having been so unmistakeably proved, many improvements in the larger manufactories of England, not only of those engaged in manufacture of cotton, but in other branches of industry, have resulted from the enlightened and profitable system commenced barely thirty years ago by the founders of Lowell, which is now a city containing nearly 35,000 inhabitants.

Statistics of the Lowell corporations.

In that place there are eight manufacturing corporations, exclusively employed in the manufacture of cotton goods, two of which print and dye their own fabrics, and one company (Lowell Manufacturing Company) which manufactures cotton Osnaburgs in addition to its staple production of carpets. There are thirty-five mills, besides the print works above named, belonging to these companies. (See Table, Appendix No. 1.) These produce 2,139,000 yards of piece goods per week, consisting chiefly of sheetings, shirtings, drillings, and printing cloths, varying in quality from No. 13 to No. 40. The greater portion, however, are No. 14s and No. 13s. The consumption of cotton is 745,000 lbs. per week, spun and manufactured upon 320,732 spindles and 9,954 looms. The average per spindle is 1¼ yard per day, the medium produce of a loom being, in 14's 45 yards, and 30's 33 yards per day. The number of operatives employed in the cotton manufacture by the eight corporations exclusively engaged therein is 6,920 females and 2,338 males. This, however, does not include those employed by the Lowell Manufacturing Company in their cotton mills, as the returns only show the gross number of hands engaged in the cotton, carpet, and other departments of that establishment. The average wages of females, clear of board, is $2, or about 9*s.* 6*d.* sterling, per week, whilst the wages of males show an average of $4 80 cents, or about £1 2*s.* sterling, per week. The average hours of labour per day, *exclusive of meals*, is 12, the mills commencing at 5 a.m. and closing at 7 p.m.

Wages at Lowell.

Hours of labour at Lowell.

Character of cotton goods.

Of the quality of the goods produced, it will be sufficient to say, that they are generally excellent of their class, and quite equal, sometimes superior, to similar manufactured in Britain. Those of Lowell may be taken as fair examples of other cotton mills in the United States, possessing the same advantages as regards power, improved machinery, and intelligent operatives. In spinning, it will be seen that the numbers are low, the finer quality of cotton goods not being produced. The No. 40s "printers" manufactured by the Merrimack Company being the highest class. These, when printed, are of a firm and excellent fabric. The Lowell Manufacturing Company produce a very cheap and well-looking fabric for cotton trowserings at 17½ cents, or about 9½*d.* sterling, per yard. These are made up of dyed yarns in checks and stripes, and are woven on gingham looms.

Cotton trouserings.

In selecting the cotton manufactories of Lowell as an illustration of other manufacturing localities engaged in the same branch of industry, it must be borne in mind that each of the latter have certain features peculiarly their own; but as the statistics of Lowell, as given (see Table-Appendix, No. 1), fairly represent the rate of production, &c., in the class of goods included therein, in the best and most extended form as to economy, organisation, &c., in a group of establishments, no useful purpose can be served in quoting the relative rate of production of single manufacturing companies in groups of two or three. It will be sufficient, therefore, in glancing at the cotton mills of Lawrence, Manchester, and Holyoke, to quote the total productions from returns courteously furnished by their respective agents or managers.

Mills at Lawrence, Massachusetts.

As the manufacturing establishments of Lawrence are intended by their enlightened proprietors to comprise all the advantages derived from the experience gained at Lowell, I would beg to quote the following description of the Atlantic Cotton Mills,* from the Appendix to the Sanatory Report presented to the Legislature of the State of Massachusetts in 1850:—

Atlantic cotton mills, Lawrence. Massachusetts.

"The Atlantic Cotton Mills have erected a building 600 feet in length, five and six stories in height, partly 64 and partly 106 feet in width, which is devoted to the manufacture of brown cotton goods. It is designed to contain 42,500 spindles, and 1,168 looms: 25,088 spindles and 728 looms are now in operation; and 164 male and 619 female operatives are employed. This number will be increased to about 1,200 when in full operation. The motive power is supplied by three of Boyden's improved iron turbine wheels, each 8 feet in diameter, and of 300-horse power; 12 mill-powers are devoted to these mills. The boarding-houses belonging to these mills consist of six blocks, containing 68 tenements, and are built upon a similar plan and have the same admirable arrangements for water, cleansing, sewerage, and other purposes, as those belonging to the Bay State Mills, noticed in the description of that establishment (Class XII; see Appendix, No. 3). 32 of these tenements are intended for the females; and 36, equally good, but containing fewer rooms, are intended for the overseers in the mills, and for men with families, who may also take boarders."

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* An admirable library has been established in connection with the Atlantic Mills by the overseers and operatives. The agent, Mr. H. K. Oliver, having given 100 volumes as a foundation, and loaned $50 for the purchase of books. Subsequently, the sum of $50 and 24 volumes was presented by the treasurer, Mr. William Gray, and further donations from the late Mr. Amos Lawrence and the Lawrence Tract Society. The library now contains 1,100 volumes; and, on an analysis of the printed catalogue, of 986 of these I find that the selection of books is admirable. There are, on History, 125 volumes; Biography, 98; Religious; 60; Fiction, 187; Poetry, 56; Travels, 78; Philosophy, 16; Science, 20; Mechanics, 10; Agriculture, 10; Natural History, 7; Miscellaneous, 319.

The permanent members, who are chiefly the overseers, pay $1 per annum; those who simply become members to use the books, pay 60 cents (about 2*s.* 9*d.* sterling) per annum; these are chiefly mill hands; and about one-third of the operatives thus subscribe to the library. It must be remembered, however, that about *one-third* of the female operatives in this mill are Irish, who either cannot read or write, or have no taste for reading. One of the hands, a young man, acts as librarian, for which he receives a small remuneration from the library fund. The books are given out, and returned every Saturday evening, half an hour after bell-time; the requisite rooms for the safe keeping of the books being found by the proprietors of the mill, rent free. G. W.

Weekly production of the Atlantic cotton mills. Lawrence, Massachusetts.

By a return for the week ending 30th July, 1853, 7,783 pieces of goods were manufactured, containing 299,262 yards, and weighing 99,647 lbs. These consist of plain sheetings, shirtings, and drillings No. 14's, and plain sheetings and shirtings No. 24's, varying in average yards to the lb. from 1·47 in drillings to 5·40 in shirtings. Examples are exhibited by the Company's agent at the Exhibition of New York.

Lawrence, like Lowell, derives its water power from a remarkable fall in the Merrimack river, across which a dam, 1,011 feet in length, has been constructed. Manchester, New Hampshire, is also situated on the same river.

Manchester, New Hampshire.

The Amoskeag Fall at this latter place has a fall of about 52 feet in one mile, and is formed into two dams, the head-waters of which feed canals on two levels, from which the power is used. The first or highest level has a fall of about 20 feet,—the second one of 30 feet. The power is estimated at 10,000 horses, of which less than 5,000 are at present in use; about 750 only being in the lower level or second canal. The natural construction of the fall was very favourable to an economic use of the power,—the upper dam being raised only 5 feet high; the engineering works of the dams and canals were consequently inexpensive in comparison to those of South Hadley, on the Connecticut, to be hereafter mentioned, or even the dam at Lawrence. Turbine wheels of large size are used, as at the latter place.

Amoskeag Company, and Stark Mills, Manchester, New Hampshire.

There are two manufacturing companies at Manchester,—the Amoskeag Company, and the Stark Mills. The former consist of four mills, the latter of two, and it is scarcely possible to conceive anything more complete than these manufacturing establishments, with the requisite boarding-houses conveniently situated for the purposes of the operatives.* The goods produced in the Amoskeag Mills are of excellent quality, and consist of ducks, tickings, denims, drillings, sheetings, and cotton flannels of varied width and quality.

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* As an illustration of the relations existing between the operatives and the corporations who employ them, it may not be uninteresting to state that on the day I visited Manchester by invitation of several of the directors, the annual meetings of the Manchester Print Works Company, and the Amoskeag Manufacturing Company, were held. The operatives employed by the latter having reason to fear that in the erection of another mill, a favourite elm, one of the last of the old forest trees on the banks of the Merrimack, would have to be cut down; hastily got up a petition, which was signed by upwards of 500 of the mill hands, male and female, and presented it to the meeting of the proprietors, requesting that, if possible, the tree should not be cut down; and giving many reasons alike creditable to the good sense and feelings of the petitioners, amongst which were, "that it was a beautiful and goodly tree," and belonged to a time when "the yell of the red man and the scream of the eagle were alone heard on the banks of the Merrimack, instead of the two gigantic edifices filled with the buzz of busy and well-remunerated industry,"—"a connecting link between the present and the past, and perhaps may serve as a ever-living, yet silent monitor, each autumn, as the aged and yellow leaf falls from among its fellows, to remind us of our own mortality." "It is, it may be therefore assumed, a *useful* tree, to say nothing of its absorbing noxious gases, and giving out healthy ones." The petitioners repudiated any intention to interfere with the arrangements of the shareholders in the disposal of their property, acknowledging how largely they were indebted to them for "the green enclosures and hundreds of trees which line the streets, all promptly cared for and protected at no inconsiderable expense; and though they could not but indulge a hope that the company would 'spare that tree,' yet," say the petitioners, "we shall not murmur if, upon the whole, by stern necessity, you should remove the object of our solicitude." The company, however, decided to comply with the wishes of the operatives so properly expressed, and, as I had every reason to believe, from the position of the tree, at no little inconvenience and cost. On examining the signatures to the petition, I was struck with the admirable character of the handwriting of the majority.

There is a savings bank attached to the Amoskeag mills, in which has been deposited $137,000 (about £27,000 sterling) since 1840, on which 5 per cent. per annum is paid by the company. This does not include amounts withdrawn by operatives leaving the establishment. And it may be well to state here, that the average continuation of females devoting their attention for a time to factory-labour, is about 2½ years at Manchester and about 3 to 3½ at Lowell. At Lowell, each corporation formerly had its own savings bank for its own operatives, allowing, as in the case of the Amoskeag Company, an interest on deposits. Now, however, they are all consolidated into one general savings bank, and the deposits amount to $700,000 (about £140,000 sterling). G. W.

The ducks and tickings are excellent fabrics, of which examples were exhibited in the Great Exhibition of 1851, and obtained a prize medal. The total productions of the Amoskeag Mills for the four weeks ending 21st May, 1853, was 1,597,166 yards, weighing 585,745 lbs.; and the amount paid in wages was,—males, $6,604 83 cents; females, $21,143 66 cents; being a total of $2,7748 49 cents, or at the rate of upwards of £6,000 sterling per month.

Monthly production of the Amoskeag mills. Manchester, New Hampshire.

Specimens of the goods manufactured are exhibited at the Exhibition of New York.

As Mr. Whitworth's engagements did not permit him to visit Manchester, it may be proper to state here that the Amoskeag Company have extensive machine shops for the manufacture of locomotive engines, and the machinery for their mills. The average number of locomotives turned out this year will be five per month.

Stark Mills Company, Manchester, New Hampshire.

The Stark Mills Company manufacture 36 and 48 inch sheetings, and 30 inch shirtings, No. 14 yarn, and 48 inch drills, No. 12½ yarn, ducks, and seamless grain bags, and an article, a species of drilling, known as leather cloth, which is now coming into extensive use as a substitute for morocco (see Class XVI). The seamless grain bags constitute a novel and important article of trade, and are of excellent quality and make. These bags are 45 inches long, and are manufactured of various qualities and weight. The warp is a double one, and, by the construction of the loom, the "filling," or weft, traverses both sides, uniting the warps at the edge, instead of producing a selvage. The loom is a perfect self-actor or automaton, so to speak; it commences the bag, goes on until the requisite number of picks has been thrown in to make up the length; it then closes the bottom, throws in a given number of picks as a *tab*, and then commences another bag. All that the weaver has to do is to attend, in the usual way, to the perfect working of the machine, and cut out each bag, as from their thickness any quantity accumulated on a cloth beam would be an incumbrance to the machine. As the bags are cut out, each weaver folds and piles them by the side of each loom, and these are removed and an account taken every half-day. The bags are hemmed round the top, or mouth, by sewing machines, each machine being attended by one female operative, and the average work of each is 650 bags per machine per day.

Seamless grain-bags.

Power-loom for seamless grain bags.

There are 126 of these seamless bag looms at work in the Stark Mills. The average make is 47 bags per loom per day, and the speed about 130 picks per minute. This is rather high, as the general speed of power-looms, and indeed of machinery generally, is lower than in England. By this means human labour is economised, and one operative can attend to more machines. Thus, it is often found that a weaver will attend to four looms in the United States, who, in the same quality of work, would attend to only two in England. I believe, however, that the conviction is gradually forcing itself upon the mind of the British manufacturer, that machinery may be run at a speed which is not economical, either as regards the quality of goods produced, or the most profitable use of human labour.

Speed of machinery

The seamless bag loom is the invention of Mr. Cyrus W. Baldwin, of the Stark Mills, and the looms are all manufactured in the machine shops of that establishment.

Pillow-cases and bed-bolsters could be as easily and as profitably produced by this loom as grain bags, but the latter are in great demand at present. Mr. Baldwin has just patented an adaptation of his invention to the weaving of cotton hose for fire-engines. The experimental loom will produce 1,000 feet of hose per day, and from the perfect character of the work, there is no material escape of the fluid when the hose is filled with water, as the fabric swells, and it is as perfect as a duct as the ordinary leathern hose, and much more elastic and portable. In point of economy, too, the cotton hose must possess great advantages, its cost being but 6½ cents, or about 3½*d.* sterling, per foot, and no oiling is required to preserve its elasticity. This alone gives it a greater advantage over the leathern hose, since both labour and material are saved; the cost of the latter being 62½ cents, or about 2*s.* 9*d.* sterling, per foot, and requires renewing every three years. Thus, if the cotton hose was renewed every year, which it is not likely would be requisite except under very peculiar circumstances, an immense saving would be effected. But a double hose, which would wear longer than the leather, and still save the oiling, can be

Cotton Hose for fire-engines.

made by inserting a smaller cotton hose within a larger one; a coating of caoutchouc rendering the whole perfectly water-tight, and less susceptible of external injury than a single hose would be. It is scarcely possible to conceive a more perfect fabric than the hose produced by the experimental loom shown to myself by the inventor, who states that it is also applicable, and that he is about to adapt it, to fancy weaving. The invention is patented in England, as well as in the United States.

Improved carding-engine.

An improvement in the carding engine is in operation here. It consists of a series of circular saws with very fine teeth, set round a cylinder. It throws out an immense quantity of dirt which escapes the ordinary carding machines. Should flax cotton ever come into general use, this would be the most fitting machine for carding it clean, and getting rid of the woody fibre, by a mechanical instead of a chemical process, the initiatory steps towards which will be mentioned in its proper place in Class XIV.

Monthly production of the Stark mills, Manchester, New Hampshire.

The total production of the Stark Mills for the month ending May 28th, 1853, was in drills, sheetings, &c., 1,046,138 yards, weighing 379,132 lbs.; in seamless bags 109,544 yards, weighing 97,895 lbs. The number of operatives employed, 1,054 females and 215 males. Specimens of the bags are shown in the Exhibition at New York, but not by the company.

Nashua, New Hampshire.

At Nashua, in New Hampshire, also on the Merrimack river, there is a considerable development of the cotton manufacture, but Manchester presents the highest type in that State. Manufactures of various kinds, chiefly cotton and woollen, may be said to be carried on at almost every available point in the Merrimack and Charles rivers, and indeed upon the smaller and more tributary streams of New Hampshire and Massachusetts. The largest river passing through the latter State, however, has only recently commanded sufficient attention to induce the employment of a sufficiently large capital in developing its immense natural advantages; and it would certainly appear that at Holyoke, on the Connecticut river, the factory system of the United States of America is destined to the fullest expansion under the most favourable circumstances as regards power, the conveyance of raw materials and manufactured goods, as also salubrity of situation for a manufacturing town.

Hadley Falls Company. Holyoke, Massachusetts.

The Hadley Falls Company have here constructed a dam across the Connecticut river, 30 feet high at the head water, and 1,017 feet long; whilst taking advantage of the peculiar conformation of the land on the banks, the application of the power derived therefrom is so arranged, that a row of mills two miles in length might be erected, and power to drive at least 1,000,000 spindles easily applied thereto. A town is laid out in a plan calculated to secure many advantages to its future inhabitants, and boarding-houses, &c. erected for the operatives employed in the two mills and machine shops already at work. Another mill intended for the manufacture of fancy fabrics is now in the course of erection. Of the two above named, one contains 18,432 spindles, for No. 14 yarn, which is manufactured into sheetings at the rate of about 5 tons weight per day. The other mill contains 30,700 spindles for No. 90 yarn, this being the finest number spun in the United States. It is manufactured into lawns, or jaconetts, chiefly for printing. There are 450 looms in this lawn mill. The goods thrown off are of a superior quality, and show that the manufacture of the finer fabrics in cotton is as likely to be successfully carried on in the future, as the coarser and more useful qualities have been in the past.

Lawns for printing.

There is only one other mill for the manufacture of lawns in the States. This is at the Portsmouth Steam Mills, Portsmouth, New Hampshire. Here there are 26,000 spindles driven by steam power, the yarn being No. 90's, as at Holyoke. Another mill for this class of goods, the Pacific Mills, Lawrence, Massachusetts, is in the course of erection, and will be in operation shortly.

Portsmouth steam mills, Portsmouth, New Hampshire.

As already indicated, there are a considerable number of mills manufacturing cotton goods, many of these, too, of large size, in detached localities in the New England States; but those visited, and now reported upon, may be considered as types of the whole.

Cotton manufactures. Manayunk, near Philadelphia.

In Pennsylvania, as already mentioned, the establishments are generally smaller, and are more isolated. There is a considerable concentration of the cotton manufacture at Manayunk, on the Schuylkill river, near to Philadelphia, but though promised the particulars as to production, class of goods, &c., it has not been furnished to me.

The manufacture of ginghams is now carried on to a large extent, particularly at South Hadley, opposite to Holyoke, and at Clinton, Massachusetts. The goods are admirable, though light in quality, of good dye, and the colours generally put in with good taste.

This, however, depends so much upon the market or class of customers for which the goods are intended, that justice to the manufacturer always demands caution in pronouncing as to the fitness or non-fitness of decoration, even in its simplest forms.

It will therefore be sufficient to say here, that the combinations of colour are often harmonious and pleasing, and sometimes even elegant, and in a material which is regularly sold at 12½ cents to 15 cents, or from 6½*d.* to 8*d.* sterling, per yard retail, and therefore within the reach of all classes.

Glasgow mills, South Hadley, Massachusetts.

Ginghams.

The Glasgow Mills, South Hadley, derive the water power which drives their machinery from the head-water of the dam constructed by the Hadley Falls Company for the works at Holyoke; indeed the privilege is rented from that corporation. They are entirely devoted to the manufacture of ginghams. The yarns, 28s and 30s, are spun on 10,000 spindles, and manufactured into cloth by 300 power-looms carrying 4 shuttles each, for different coloured yarns, and acting by means of a revolving shuttle box. Each loom produces from 28 to 30 yards per day, and the total produce of the establishment is 14,000 pieces, of 30 yards each, per week, giving a total of 52,000 yards. The yarns are all dyed on the premises, and are generally clear and brilliant in colour, and the goods have a reputation for fast dyes.

The Glasgow Mills Company contribute to the Exhibition at New York a very satisfactory assortment of dress ginghams, handkerchiefs, gala plaids, and white and coloured cotton yarns.

Lancaster mills, Clinton, Massachusetts.

The Lancaster Mills Company, Clinton, Massachusetts, manufacture ginghams on an extensive scale. The looms, 600 in number, together with 96 carding engines, are all in one room or loom-shed of excellent construction, lofty and well ventilated, the roof being of slate and glass, supported on iron columns.

There are 21,000 spindles and 800 operatives, chiefly females. The yarns are No. 25 warp, and No. 27 filling or weft. The goods therefore are of a little lower quality than those of the Glasgow Mills, which, as already stated, are manufactured of No. 28 and No. 30. The make and dye, as also the general selection of colours in the Lancaster Mills, are good, and the goods must be largely in demand, as the make averages 5,000,000 yards per annum, or 100,000 yards per week.

Cotton bed quilts. Lancaster Quilt Company, Clinton, Massachusetts.

The manufacture of cotton bedquilts by a method included in Bigelow's patent for the manufacture of Brussels carpet by the power-loom, is also carried on at Clinton by the Lancaster Quilt Company. The mill is small, and was erected for other purposes. These bedquilts are good, cheap, and useful articles, in great demand. There is considerable scope for design, untrammelled by the conditions of Marseilles or quilted fabrics, from the facility with which the figured surface can be produced. The fabric, however, does not present the substance of the ordinary quiltings, but in other respects is admirably adapted for summer use or for hot climates.

Lenna mills, Delaware county, Pennsylvania.

Tickings are extensively manufactured, and often form a department in the large cotton establishments in the New England States. The manufacture of them, with checks, stripes, &c., also form a considerable item in the home industry of Pennsylvania, and, to a certain extent, in the factory system of that State. Some goods of this class, contributed at the New York Exhibition, manufactured by D. Lammot and Son, Lenna Mills, Delaware county, Pennsylvania, are most excellent of their kind. They are 36 inches wide, 1,100 reed, No. 30 warp, and No. 35 filling or weft, with 140 picks to the inch. It is scarcely possible to conceive a firmer or better made article, and the traditionary notion that really good tickings can only be manufactured from flax receives a severe shock when such cotton goods as these are presented for examination. The Lenna Mill runs 4,000 spindles, and works 160 looms, of which latter twenty-nine are for the manufacture of the finer qualities of ticking quoted above. It is comparitively a small establishment, situated in one of those beautiful valleys, on a stream supplying water power, with which the State of Pennsylvania abounds, and which, in presenting great natural facilities, have originated the comparatively large number of small manufacturing establishments, especially of cotton and woollen yarns and goods, to be found in that State.

The manufacture of stocking-net and of cotton hosiery of the coarser qualities is gradually developing itself in various localities, especially in the states of Connecticut and Massachusetts. As, however, hosiery comes under the head of Class XX. (Clothing, &c.), this branch of industry will be noticed in its proper place.

Contributions of cotton goods to the New York Exhibition.

The display of cotton goods in the Exhibition at New York, as illustrative of this branch of industry, is, on the whole, a satisfactory one; nearly every special department having one or more representatives.

It is now requisite, in order to complete as far as possible this review of the cotton manufactures of the United States, to briefly notice such branches as may not have come within the range of business of the establishments visited and reported upon, and whose contributions to the Exhibition have been indicated in due course.

The generality of contributions of cotton fabrics most generally in demand, such as sheetings, shirtings, drills, ducks, &c., are of good make and quality, and are often well finished and neatly made up. These, however, need no special remarks, and a reference to the catalogue for the names of the contributors will be sufficient.

Silesias.

The Silesias manufactured by the Franklin Manufacturing Company, Providence, Rhode Island, as also the same kind of goods, together with nankeens and drills of a fine quality, manufactured by Goddard Brothers, of the same place, are excellent fabrics, well dyed and finished.

Canada plaids.

Cotton damasks and quilts.

The Canada plaids, adapted for vestings, manufactured at Whittenton Mills, Taunton, Massachusetts, are excellent in make and dye, and in good taste in the selection of the colouring. In cotton damasks and quilts, dyed and plain, the goods of Malcolm and Heskett, Paterson, New Jersey, are the only examples of American production of their kind. They are of fair make, and the usual character in design.

Cotton cordage and twine.

The cheapness of cotton in the United States, as a raw material, causes it to be used for many of the purposes for which flax and hemp are alone employed in Europe. The cotton sailcloth shown at the Great Exhibition of 1851 was an evidence of this. Therefore cotton is largely used in the manufacture of cordage and twine, and the examples shown in the Exhibition at New York are very excellent. The American Cordage Company, New York city, exhibit specimens of patent cordage, rope rigging, tow-lines, &c., of various sizes. These are remarkably clear in the strand, and are evidently made with great care. Cotton seine twine, and cotton lines for drift and other nets, are also exhibited, which show how largely cotton is employed in this branch of trade.

Cotton fishing-nets.

Fishing nets of cotton-twine are woven by Mr. John McMullen, of Baltimore, on a loom of his own invention. These are not exhibited, but they are quite equal in every respect, probably superior, to hand-made nets.*

Candle and lamp-wicks.

Cotton-wick for candles and lamps forms another item of the cotton trade in the United States, lamp-wicks being largely consumed. Mr. A. Wortendyke, Godwinville, near Paterson, New Jersey, exhibits specimens of cotton-wick, counter-twist wick for patent machine mould candles, and chandler's wick. These are excellent examples of their kind.

Estimate of the position of the cotton manufacture.

The estimate formed of the present position of the cotton manufacture of the United States must be one of no merely apologetic character. All that has been attempted has been well done, not only in the results, but as regards the methods by which these results are attained; and if, as will undoubtedly strike the European observer, many of those developments of the cotton trade in its finer and more ornamental fabrics are as yet unattempted, it must be remembered that the useful fabrics, those absolutely necessary to the comfort of the great mass of the people, were those which would be first in demand, and most likely to remunerate the enterprise of the earlier manufacturers.

Calico purchased at Boston in 1813.

In the New York Exhibition a specimen of British calico is exhibited, which was purchased by the contributor, Mr. Hagerson, at Boston, in 1813. Its width is 33½ inches, its price at that date 85 cents, about 4*s.* sterling, per yard. The same quality of cloth can now be purchased for 3½ cents, about 2*d.* sterling, per yard. An illustration like this proves how largely manufacturing skill, not only in Europe, but in America, must have progressed since that period; diffusing health and comfort, independence and happiness, by affording occupation to hundreds of thousands in both continents; whilst its influence has been felt in the social relations of life in a remarkable degree in the United States, as evidenced by the condition of the people in Lowell, Manchester, Lawrence, and other places of less concentration, but not of less skill, enterprise, and industry, or of lower tone as regards morals or social position.

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* See Mr. Whitworth's Report on this invention.

Communication from Georgia on the growth and preparation of cotton.

Since my return to England, I have received through his Excellency, John F. Crampton, Her Majesty's Minister at Washington, two communications from Mr. Henry Le Weeks, Hannahatchei, Stewart county, Georgia, making inquiry as to certain conditions in the growth and preparation of cotton, for the information of the planters of the Southern States. The questions asked appeared so important that, being desirous to obtain and transmit the best practical information, I communicated with Thomas Bazley, Esq., President of the Manchester Chamber of Commerce, and Henry Houldsworth, Esq., also of Manchester; and subsequently, at the suggestion of Mr. Bazley, with Robert Hyde Greg, Esq., Norcliff, near Macclesfield. Each of these gentlemen furnished me with replies to the questions transmitted, which I embodied in a reply to the communications of Mr. Le Weeks.

A copy of that reply, and of the communications to which it is an answer, will be found appended. (See Appendix, No. 2.)

CLASS XII.

WOOLLEN AND WORSTED.

Woollen manufactures.

Next to cotton manufactures in extent and value, but scarcely less in importance, are the various branches of the manufacture of woollen and worsted goods now carried on in the United States. Many of these are of comparatively recent introduction, whilst others have been pursued for years under many disadvantages, both as regards the supply of raw material, and the skilled labour requisite to carry out the more perfect finish of the better class of goods. In many respects these difficulties have been in a great measure overcome, and the higher class of woollen goods produced in America will, in many respects, compare with similar fabrics manufactured in Europe. But it is more than questionable whether, as is frequently asserted, the wool of which these goods are manufactured is of American growth, unless in some special instances, or where the material has been carefully selected for the purpose. For though American wool is particularly well adapted to casimeres and stuffs, from the length of its staple, it is not so well suited to the manufacture of broadcloths. This opinion is borne out by that of the most experienced buyers of this class of goods. There can be little doubt, however, that the position to which the manufacture of the higher quality of cloths has attained will stimulate the growth of the finer qualities of short staple wool. And when the success of the examples shown by the American growers at the Great Exhibition of 1851 is remembered, it must be quite evident that an accurate knowledge of the requirements of the woollen manufacture in its two great divisions, the one demanding a "carding," and the other a "combing" staple for their perfection in fabrics, is alone needed to enable the growers of the United States to meet all the requirements of the home demand, at least. At present German, English, and Australian wools are imported for the manufacture of certain classes of goods; but, according to the report in the census of 1850, the largest proportion of imported wool comes from Buenos Ayres and the neighbouring States on the Rio de la Plata. This is of a coarse and cheap variety, costing from 6 cents to 8 cents, about 3¼*d.* to 4¼*d.* sterling, per pound. The same authority states that the imported wool amounted up to that date to about one-third of the whole raw material manufactured, but that whilst in 1850 the quantity of wool imported into the United States was 18,669,794 lbs., valued at $1,681,991

American wool.

(about £400,000 sterling), a remarkable increase took place in the year 1850-51, far exceeding the importations of any previous year, being 32,548,693 lbs., and to the value of $3,800,000 (about £900,000 sterling). This would go to prove a great and sudden increase in the woollen manufactures, and this is borne out by the fact that many of the larger establishments were either commenced, or largely increased their make about this period, particularly in the coarser quality of carpets, and the manufacture of felted goods.

Statistics of the woollen manufactures.

By the census returns of 1850, twenty-four of the thirty-one States of the Union, and the district of Columbia, had establishments engaged in some department of the woollen manufacture. The seven States in which this branch of industry had not been commenced were, South Carolina, Florida, Alabama, Mississipi, Louisiana, Arkansas, and California. The New England States had not so many establishments in operation as the two States of Pennsylvania and Virginia, and only five more than those of New York and Ohio. Thus it will be seen that, whilst the cotton manufacture is located more exclusively in the Eastern States, the woollen manufacture is extended in almost equal proportions over the whole of the Middle States, and extends itself into the western regions and towards the south. The extent of the woollen manufactures of Massachusetts, however, is seen in the fact, that whilst in the 380 mills of Pennsylvania the consumption of wool is 7,560,379 lbs., employing 3,490 males and 2,236 females, producing 10,099,234 yards of cloth and 1,941,621 lbs. of yarn, of the annual value of $5,321,866 (about £1,300,000 sterling); 119 establishments in the first-named State consumed 22,229,952 lbs of wool, employ 6,167 males and 4,963 females, and produce 25,865,658 yards of cloth and 749,550 lbs. of yarn, of the annual value of $12,770,565 (about £3,000,000 sterling). The difference of the modes of manufacture in the two States abovenamed, as illustrated by the cotton trade, is here shown again in the fact, that a very large proportion of the produce of the woollen mills of Pennsylvania is yarn only, a large amount of this being consumed in home manufacture for domestic use, or in the weaving of mixed goods and carpets by hand, and this, too, in addition to the home-spun woollen yarns mentioned as being worked up with the cotton yarns produced for that purpose. The 130 establishments in Ohio, as also 121 in Virginia, 25 in Kentucky, and 33 in Indiana, would appear to manufacture the greater portion of the yarns spun therein; it is probable, therefore, that the yarns of Pennsylvania are largely used for the supply of the West in the materials for home weaving. After all, however, this department of industry is becoming daily more and more exceptional; but it is interesting as illustrating the early condition of a new country in its efforts to supply its own wants, in the absence of that larger development of manufacturing means and appliances which capital, skill, and a large and ever-increasing demand can alone establish on a firm and enduring basis.

Woollen yarns.

The total number of persons employed in the various establishments for the manufacture of woollen goods in the United States in 1850 was 22,678 males and 16,574 females.

Wages, as in the cotton trade, vary very much in different localities, but the average appears to be slightly lower than in that department of industry in the New England States, whilst it is higher in Pennsylvania. In the Western States the increased average is considerable.

Middlesex mills, Lowell, Massachusetts.

Broadcloths.

Cassimeres.

Many of the establishments of New England being very extensive, are conducted upon a similar plan to the larger cotton mills. At Lowell, the Middlesex Company's mills present a good type of this higher class. The number of operatives employed is, males 575, females 730. The mills run 16,340 spindles, with 75 looms for broadcloths, and 328 looms for cassimeres. The weekly production is 24,000 yards of cassimeres, and 3,000 yards of broadcloths. Cheap broadcloths are produced here, with a cotton warp, presenting a very good surface. These sell at $$1\frac{1}{2}$ (about 7*s.* sterling) per yard. Doeskins are the chief make, and, with beaver cloths and cassimeres, are manufactured entirely of native wool. The printed trouserings manufactured by this company are, in common with similar goods produced by others, of a very effective character. The colours are clear, and generally well selected, and the style and finish much better than would be generally supposed by those whose ideas of fancy cassimeres are set upon woven patterns only, and they appear to suit a large class of buyers, particularly for the western

Doeskins.
Beaver cloths.

Fancy-printed cassimeres.

markets, as being at once low in price and showy in character; and the colours are said to wear better than European opinions of such modes of production would give them credit for. The general make of goods by the Middlesex Company is illustrated in the Exhibition at New York.

Bay State mills, Lawrence, Massachusetts.

The Bay State Mills, Lawrence, Massachusetts, may be said to offer the best type of a large woollen establishment, manufacturing a great variety of fabrics. These mills form a model establishment, so to speak, of its class; alike as regards extent, construction, machinery, arrangement and internal economy. It has been therefore thought advisable to extract an illustrated description of it from the Report of the Sanitary Commission of Massachusetts, 1850, given in the Appendix. (See Appendix, No. 3.)

Monthly production of the Bay State mills.

There are 1,000 males and 1,200 females employed at present in the Bay State Mills, working 98 sets (3 to a set) of carding engines, and 700 looms, together with the dye works and printing shops for flannels and carpets. In the week ending 7th May last, the production of this establishment amounted to 40,898 yards plain flannels, 3,962 yards twilled flannels, 10,159 yards fancy cassimeres, 6,770 yards satinettes, 1,030 yards broadcloths, 568 yards beaver-cloths, 1,703 yards felted carpets, 2,752 yards felted beavers, 1,540 yards felted linings, 1,464 long shawls, all wool, and 5,970 square shawls.

Dyed and printe flannels.

The flannels are all either dyed in fancy colours or printed. The latter is chiefly block work, although cylinders are used for some styles. These fancy coloured flannels are extensively used in the United States for children's clothing, and make up into elegant-looking, yet low-priced, articles of dress. The cassimeres are of good make, and the pantaloon satinettes (cotton warp) are excellent of their kind in colour and finish.

Pantaloon satinettes.

Felted cloths.

The felted fabrics manufactured are noticeable as being produced by a different method to that adopted by any other establishment.* These are excellent goods, both as regards the firmness and, to a certain extent, elasticity of their texture; and the imitation "petershams" are superior to even the general run of common cloths for overcoats. In England there still exists, and perhaps not without cause, a strong prejudice against all felted fabrics for clothing. It would appear, however, that they are largely used in the United States in making up cheap clothing. There are some peculiarities of the people, however, as affecting consumption, which will be considered in due course.

Felted lining-cloth.

The felted lining cloth, composed of gauze and a comparitively small quantity of wool, is a new and useful fabric. The wool is felted down upon the gauze as a back, and the substance obtained by this means is much greater than the quantity of material employed would warrant any one to expect. When the back or gauze surface is concealed by the use of the fabric as a lining, the result, as regards appearance, is very satisfactory, and it is said to wear well, as the two materials are fairly united by the felting process.

Woollen shawls.

The manufacture of woollen shawls was first commenced in the United States at this establishment, and is the only one in which they are yet manufactured, to any extent, at least. They consist of gala plaids, manufactured chiefly of American wools. The general styles are well selected, and the dyes and finish well managed. The fringing machine is a useful and ingenious contrivance, by which the threads constituting the fringe of each shawl are twisted to a proper tension. It does the work usually performed by hand, and accomplishes as much as 10 females.

Fringing machine for shawls.

Printed shawls.

The printed shawls prepared at the Bay State Mills are of the usual character as regards fabric; the patterns being chiefly oriental in style. They are all printed, dyed, and finished before they leave the establishment.

There is an excellent display of the shawls manufactured by the Bay State Mills in the Exhibition at New York.

The printed felted carpets or druggets made here will be duly noticed in their proper class (XIX).

Manhan Manufacturing Company, Waterbury, Connecticut.

On visiting the Manhan Manufacturing Company's Works, Waterbury, Connecticut, I found the more general felting process at work for the production of felted cloths of good character, chiefly for overcoats. An excellent imitation of "petersham" is also made here, the curled surface being well wrought and finished. Felted carpet fabrics are also manufactured, but not printed, in this establishment.

Clinton company, Clinton, Massachusetts.

At Clinton, Massachusetts, the Clinton Company, in

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* See Mr. Whitworth's Report.

Pantaloon stuffs.

addition to the manufacture of coach lace, to be hereafter noticed, employ 100 looms in making pantaloon stuffs, being mixtures of cotton and wool. The looms are similar to the gingham looms mentioned in Class XI, and the fabric produced is a well-looking and cheap article, for which there is a large sale.

Woollen manufactures of Maryland.

Fulled linseys.

In Maryland there is a considerable development of the woollen manufacture; and, in this State, the highest as well as the lowest class of goods manufactured may be said to be produced. Baltimore is the centre of this trade, and a coarse quality of fulled linseys, six quarters wide, form a species of domestic manufacture of the district 50 miles round that city. These linseys are chiefly manufactured for negro clothing, and are sold to the planters at the South for the use of their slaves. Considerable quantities, too, are sold in the West, as far as the Missouri and the Rocky Mountains, being used there for the clothing of labourers and backwoodsmen.

Garment plaids. State Penitentiary of Maryland.

In the State Penitentiary of Maryland, at Baltimore, coarse garment plaids, of good make, are woven by hand by the prisoners. The cotton and woollen yarns are also spun and dyed by them. The colours are generally clear and brilliant, being selected with more discrimination, as regards taste, than is generally found in the coarse class of goods either in America or in Europe. The fabric is an useful one, and is in such demand in the Southern and Western States, that manufacturers are induced to get up imitations in competition with the article as produced in the Penitentiary.

The produce of the Penitentiary looms is about 500 pieces per week. The return promised by the Warden, of the number of looms, carding engines, and spindles, together with the number of persons employed in this department, has not, however, reached me.*

Wethered and Brothers, Baltimore.

Woollen goods in the Exhibition at New York.

At the establishment of Messrs. Wethered and Brothers, Baltimore, the manufacture of the higher qualities of doeskins and fancy cassimeres is very successfully carried on, and the examples contributed by them to the Exhibition at New York are a most satisfactory proof that, for all practical purposes, the American cloths are equal in quality and finish to similar goods produced in Europe. This is confirmed by the cassimeres, doeskins, and satinettes manufactured by Jacob T. Seagreave and Company, Burrellsville, Rhode Island; Platner and Smith, Lee, Massachusetts; Slater and Sons, and the Vassalboro' Manufacturing Company, Maine, exhibited at New York by their respective agents. The latter company exhibit three-quarter cassimeres, made of Silician wool (4,000 warp), of an exquisite texture and beauty of finish. In fact, the contributions to this department of the Exhibition at New York, though not very numerous or extensive, go to prove very distinctly that, in the production of the finer qualities of woollen goods, great advances have been made in the United States. The efforts after novelty, however, do not always lead to successful results in European eyes, and the fancy trouserings are often extremely *outré* in pattern.

Fancy cassimeres with Jacquard woven patterns.

The Jacquard has been lately introduced into use in the production of figure patterns in fancy cassimeres. There are good specimens of these manufactured by the Melville Manufacturing Company, Melville, Massachusetts. The pattern being woven, the goods are slightly fulled afterwards, and the result is satisfactory when too defined a figure has not been attempted. In small patterns the fulling process breaks down the forms, and thus gives, when finished, an agreeable variety to the surface.

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* The profitable employment of prisoners is a rule in all the State penitentiaries of the United States.

The labour is farmed out to a contractor, who finds the proper tools, machinery, and materials of labour. In the Maryland Penitentiary, in addition to the spinning and dyeing of yarns, and weaving the fabrics named, rag carpets are woven in looms adapted to the purpose, the weft, or filling, being composed of white and coloured rags twisted or spun into a strong cord or yarn. There are also extensive workshops, in which wooden pails and buckets are made; chiefly by machinery directed by the prisoners, and the manufacture of corn brooms, so largely used for domestic purposes in the United States, is also extensively carried on. A large nail forge, chiefly for the manufacture of railway pins by a mechanical contrivance, is another branch of industry pursued by the prisoners; and the dressing of bristles, for the use of brush makers, is about to be added to the employments already followed.

The prison authorities have nothing to do with the direction of the labour, that being in the hands of the respective contractors. They enforce the discipline of the prison, and obedience to the direction of those employed by the contractors to superintend the work.

The earnings, or returns to the State, of even the lowest class of prisoners in the Maryland Penitentiary is 62 cents. (about 2*s.* 10*d.* sterling) per day. Each prisoner is tasked to earn a certain amount, according to his employment or presumed capacity. All above the amount is carried to his account, and paid to him when he leaves the prison, or he is permitted to purchase such books as the Warden approves of. This is the mode in which many prisoners for life prefer expending their surplus earnings, and many of them have excellent collections of books.

In the New York State Penitentiary at Sing-Sing, cutlery of a very superior quality is said to be manufactured, but time did not permit of an inspection of the industrial operations in that prison.
G. W.

Satinettes.

The satinettes manufactured by the Perkins Company, Akron, Ohio, speak well for the progress of the woollen trade in the west.

The perfection of dying and finish to which felted fabrics have been brought is well illustrated by the goods manufactured by the Union Manufacturing Company, and Lonnsburg, Bissell, and Company, Connecticut, and the Winipank Mills, in the same State. It is scarcely possible to believe that so simple a process as that of laying sheets of wool in succession, and, by mere vibration, working them together, could produce such fabrics as the best kind of American felted cloths certainly are.

Blankets. Flannels.

The blankets and flannels exhibited at New York are fairly illustrative of the excellence which the manufacture of this class of goods has obtained in various parts of the United States.

CLASS XIII.

SILK.

Silk manufactures.

The manufacture of silks is comparatively exceptional in the United States, and notwithstanding many vigorous attempts, not only to establish the manufacture, but to raise the raw material on an extensive scale, little has resulted except in the production of sewing and fringe silks and twist.

Growth of raw silk.

The growth of silk in any considerable quantity never appears to have been fairly realised, although in the State of Connecticut, where the greatest number of establishments are still carried on for the manufacture of sewing silks, it rose from 2,430 lbs. weight in 1827 to 176,210 lbs. in 1844, being an approach to one half of the whole amount produced in the United States in that year, viz., 396,790 lbs. The decrease since that date to 1850 has been so great, that it is quite evident comparitively little is now doing in the culture of silk, since only 10,843 lbs. is given as the production of the latter year.

Taking a deep interest in this department of industry, and the probable value of silk as a collateral crop to the farmer in a country in which there appeared no difficulty whatever in the raising of the silkworm, I prosecuted my inquiries as far as time would permit, hoping to be enabled to reconcile the very contradictory opinions abroad on this question. It is acknowledged on all hands that many portions of the United States are well adapted to the growth of the mulberry tree, and the healthy development of the silkworm; but it was also quite as evident that the active habits of the people were not adapted to the work of looking after the cocooneries, or managing filatures for reeling the silk. This work, however, was attempted to be carried out in large establishments during the period intervening between 1831 and 1845. The "*Morus Multicaulis*" speculations arising out of the mania for mulberry trees, and the failure of the cultivation of raw silk on a scale not at all suited to the peculiarities of its growth and culture, produced a reaction in the public mind in the latter year; and since that period the growth of silk has been comparitively neglected, even where it might be successfully carried on in the manner usual in France and Italy, if the habits of the agricultural classes were not, more or less, opposed to a somewhat sedentary occupation, requiring, for a certain period of the year, incessant attention. It was this which doubtlessly suggested large establishments for the care of the silkworm, but when disease attacked any portion, the whole perished. It was found too that the "morus multicaulis" was comparitively worthless, and that the native and best varieties of the white or Italian mulberry produced the only silk really worth growing.

States best adapted to the growth of silk.

The States of Virginia, Ohio, Kentucky, and Tennessee are generally acknowledged to be admirably adapted for the growth of silk, and excellent examples of the produce of each State have been, from time to time, brought forward, and there can be little doubt that, under a proper system of domestic culture, with suitable centres for receiving the cocoons and reeling the silk, an excellent material would be the result.

Former growth of silk at Economy, Pennsylvania.

At Rapp's Colony, or "Community of Economy," on the Ohio river, Pennsylvania, the annual produce of cocoons was formerly 3,000 lbs. weight, which was reeled and partly manufactured on the spot. Mr. R. L. Baker, the present director of this establishment, now states, however, that the growth of silk has been abandoned, having ceased to be at all profitable.

At Wheeling, Virginia, Mr. J. W. Gill still continues to collect cocoons and reeled silk from the States above named, and this is manufactured, with the addition of foreign silk, into a variety of goods, but not to any extent.

Silk manufacture near Cincinnati, Ohio.

American silk is also manufactured on a small scale, and, with the addition of the imported material, at Newport, Kentucky, on the opposite side of the Ohio to Cincinnati. Here are five or six looms, and a little throwing and winding machinery, the property of Messrs. Jones and Wilson. The manufacture is carried on by the latter, an English weaver from Macclesfield. Specimens of the goods produced are displayed in the Exhibition at New York, and consist chiefly of neck-ties, vestings, and dress fabrics of very fair quality and finish, and excellent grey goods for printing. Mr. Wilson, a practical weaver, understanding his business and desirous to improve it, is thoroughly impressed with the capabilities of the district around for the perfect growth of silk equal to the best Italian, but confesses that he sees little prospect of the culture being so managed as to be of much importance for many years to come. Native reeled silk costs $5 to $5 50c. per pound. Imported silk can, however, be purchased for much less, notwithstanding a duty of 15 per cent. Thus this latter fiscal restriction is of no practical value, but, on the contrary, adds to the difficulty of the manufacturer, the 25 per cent. duty on manufactured goods giving him little or no advantage, for the 7 per cent. waste, which he cannot work up in the United States, has to be sent to England at a great loss, and no drawback is allowed on the raw material thus exported by the original importer.

Cost of native silk.

Duty on imported silk.

Sewing silks, New England.

There are several manufactories of sewing silks at Mansfield, Connecticut, and a few other parts of New England. In 1845 there were four mills in Norfolk County, Massachusetts, consuming 12,900 lbs. of silk per annum; in Hampshire County three mills, consuming 6,100 lbs.; and in Middlesex County one mill, consuming 3,505 lbs. Probably the largest establishment of the in the United States is that of Mr. John Ryle, Paterson, New Jersey. Sewing silks, floss silks, and silks for fringes and gimps, constitute the production of this mill, which is a well conducted and compact concern, near the Passaic Fall, on the river of that name. The consumption of material is from 1,000 lbs to 1,200 lbs. weight of silk per week. The articles manufactured are excellent of their kind.

Paterson, New Jersey.

Philadelphia.

At Philadelphia a branch of a firm at Macclesfield, Cheshire, is carried on for the manufacture also of sewing silks. Mr. B. Hooley, the proprietor, tried the production of ribbons, but did not succeed in making them at such a price as would command a market.

Ribbons, Philadelphia.

Silk braids.

Silk fringes.

Ribbons, however, are manufactured by Messrs. Horstmann and Sons, of Philadelphia, but rather as a means of keeping their extensive establishment for the manufacture of silk braiding and fringes in full work, at periods when the latter are not in sufficient demand, and the braiding machines are so constructed that, by the substitution of the jacquard, ribbons can be woven upon them. This concern will be alluded to under another head (Class XX.).

West Newton, Massachusetts. Silk braid.

At West Newton, Massachusetts, Messieurs Plymton, Stevenson and Company, of Boston, have a small establishment for the manufacture of silk-braid and ribbons. The braids are generally tasteful in design and well made; the ribbons, however, are deficient in surface and show a want of experience in the weavers. Here, also, the jacquard machine is applied to the braid-looms when required for ribbons. There are not more than twenty of these.

Power-loom brocatelles.

Eagle Mills, Seymour, Connecticut.

The most important enterprise in the silk trade now prosecuting in the United States is that of the application of the power loom to the weaving of brocatelles at the Eagle Mills, Seymour, Connecticut. This establishment has only recently commenced work. The machinery is beautifully constructed, and works with great accuracy. The looms carry revolving shuttle-boxes, and are all made upon the premises. Ten looms are in full work, five preparing, and ten more in the course of construction. The goods manufactured are 48 inches in width, of firm fabric, but defective in the surface. This arises more from the evident inexperience of the weavers, than any defect in the mode of production. These weavers are females, selected from carpet manufactories, and, of course, lack the practised eye of the silk weaver in detecting defects. Cotton is chiefly thrown in for the backs, though linen is sometimes used. The designs are French in character and superior to those generally produced in such fabrics. The price varies from $3 to $3½—that is to say, from 14*s.* to 19*s.* sterling per yard; but it must be taken into account that the width is twice that of similar goods as generally manufactured in England.

Power-looms for weaving brocatelles.

A very excellent adaptation and improvement upon the French and English "reading off" and card-cutting keyboard machine is used in this establishment, the invention of the superintendent.

Card-cutting machine.

This would appear to be the first attempt to fairly introduce the manufacture of the higher class of silk goods into the United States; and there is every probability that it will be a successful one, from the admirable character of the arrangements and accuracy of the machinery, when directed by increased experience.

The goods intended for exhibition by this Company had not been arranged at the Exhibition at New York at the period of my departure, and the display in this class was very scanty.

Silk goods in the Exhibition at New York.

Examples of upholstery silk damasks, brocades, and silks for ecclesiastical decorations, the production of European weavers, manufactured by the exhibitor, Mr. Jacob Neustader, of New York, presented some points of excellence, and a few examples of sewing-silk were illustrative of this branch of the silk trade.

From these remarks it will be readily understood that this department of industry is comparatively in its infancy, and that, in the growth and preparation of the raw material, the United States have receded, and not advanced, since 1844.

CLASS XIV.

FLAX AND HEMP.

The extensive use of cotton for many of those fabrics which in Europe are manufactured of flax, and even of hemp, such as sailcloth, sacking, twine and cord, has evidently not been favourable to the employment of the latter as materials. The manufactures of flax seem, at present to be altogether exceptional, whilst hemp is employed to a considerable extent in most of the large cities of the United States in the production of ropes and cables, tarred and untarred, and of these, together with a few specimens of sailcloth and hemp carpeting, there are some creditable examples in the New York Exibition. The growth of hemp in the United States, as shown by the census of 1850, is returned at 35,093 tons, but there is some doubt as to the accuracy of the return, and no means of comparison with former statements, as the gross produce of flax and hemp were given together in 1840. Manilla and Sisall hemps are imported, but the hemps of the States of Missouri and Virginia are largely used. Formerly New Jersey exported a considerable quantity of hemp.

Manufactures in Flax and hemp.

Growth of hemp.

The cables produced in the navy-yards of the several cities, where such establishments are kept up by the Government, are of a very high character.

Cables.

In the manufacture of flax, improvements in the preparation of the fibre appears to engage more attention than any other point. A machine has been recently invented which seems likely to produce some satisfactory results as regards the preparation of flax-cotton, by mechanical rather than a chemical operation.

New flax machine.

Growth of flax.

Flax is largely grown in some of the States for the seed, for oil making, and the straw is at present thrown away. In some parts of Pennsylvania and Ohio, it can be bought for from $4 to $5 (about 19*s.* to 24*s.* sterling) per ton, delivered to the consumer, and can often be obtained for the mere cost of carting away, after the separation of the seed. Flax-seed is raised at from 15 to 20 bushels per acre, usually 16 to 18 bushels. This sells at $1 per bushel, and, if more cultivated, the price would perhaps be reduced to 40 cents.

Flax cotton.

In the mechanical process above named, the straw is put through a machine and crushed by rollers. By an arrangement for a difference of speed in these rollers, the fibre is torn to pieces and reduced to a cotton wool, the woody fibre falling out in the process.

The flax, thus prepared, can be sold without further preparation to paper makers at 2 cents (about 1¼*d.* sterling) per pound. A chemical process is applied simply to bleach, after the separation. This statement as to the growth and price of flax, and the results of the mechanical operation of the machine, is given on the authority of Mr. Kennedy, of the firm of Messrs. Kennedy, Childs and Company, Penn Cotton Mill, Pittsburg, Pennsylvania. The samples of unbleached flax-cotton, prepared by this process, appeared, on examination, to be of sufficient length of fibre for spinning on the ordinary cotton machinery, and only to require finally freeing from the smaller particles of woody substance. For this purpose, the new carding-machine, in operation at the Stark Mills, Manchester, New Hampshire, alluded to iu Class XI., seemed most especially well adapted from the thorough manner in which it clears the material submitted to its action.

Flax carding.

CLASS XV.

MIXED FABRICS.

Mixed fabrics.

The mixed fabrics manufactured in America have been treated of in Class XII., alike for convenience as from the fact that they chiefly belong to that class of manufacture, though composed of other materials as well as wool.

The only fabrics calling for notice here are mouselline de laine and barrage, which are manufactured by a few firms in New England, the most extensive being the Manchester Print Works Company, Manchester, New Hampshire, and the Hamilton Woollen Company, Southbridge, Massachusetts. The produce of the Manchester Company's mill, for the week ending June 4th, 1853, was 422,389 plain de laines, 7·44 yards to the pound. The printing and dyeing of these goods will be considered in due course in Class XVIII.

Grey mousellines de laine.

The grey mousellines de laine manufactured by the companies above named are firm fabrics, of a fair class, and are woven by power. The Manchester Company employ 400 looms in the manufacture of varied qualities of de laine and barrage cloths; the coarser kinds of the former being woven of No. 37 cotton warp, and No. 40 wool weft or filling. In the finer qualities, No. 70 cotton warp, spun on the Potter mule, and No. 50 wool weft, spun on the Smith mule, are used.

Silk and wool flannels.
Printed shawls.

The contributions in this class to the Exhibition at New York are very limited. The specimens of silk and wool flannels are good, and the fabric of the printed shawls of the usual character; the patterns of the latter being of the oriental style.

CLASS XVI.

LEATHER (EXCLUSIVE OF TANNERIES), FURS, &C.

Manufactures in leather.

The manufacture of leather in its various forms and qualities, and its making up into articles of use, has grown into an important branch of the industry of the United States. Differing in no important point with the methods used, or the purposes to which it is applied in Europe, the manufacture of leather into saddlery, harness, portmanteaus, &c., is carried on in almost every town of any importance, and the trade is conducted on a similar principle to that usually adopted in England. Occasionally large manufactories of portmanteaus and harness are met with; but these are exceptional. At Philadelphia the manufacture of articles in leather is followed to a very considerable extent, and the harness and saddlery produced in this city is of a very superior character, alike as regards workmanship and beauty in design. Nor are the productions of New York and Boston less noticeable for the same qualities.

Harness and saddlery.

Portmanteaus.

In portmanteaus, valises, and other articles for use in travelling, considerable ingenuity in arrangement is often shown. The workmanship and finish of the best class of goods are unexceptionable, and, even in the cheaper and lower qualities, the style in appearance is a matter of much consideration, and displays a decided advance, in point of taste, upon the unsightly character of the cheaper kind of travelling conveniences in England.

Manufactures in leather in the Exhibition at New York.

There are very few examples of portmanteaus contributed to the Exhibition at New York. In harness and saddlery, however, there are specimens showing great skill in execution, as also fitness and beauty in construction and decoration. The whips are generally of excellent workmanship, but the mountings are often in the absurb taste which at present prevails in Europe.

Whips.

Furs and feathers.

Artificial hair.

In furs and feathers, those shown, though of American production, are more or less of European manufacture, and in artificial hair there are some clever contrivances.

Furs from the State of Minnesota.

Specimens of furs from the State of Minnesota are also exhibited. These chiefly consist of marten, otter, fisher, mink, and beaver, together with buffalo robes and bear-skins, and are generally well preserved and of fine surface. Minnesota is the great fur-producing State of the Union, and the trade of 1852 is said to have reached nearly $700,000 (about £170,000 sterling).

The specimens of various kinds of leather contributed to the Exhibition at New York, show in a most favourable light the ability of the Americans as tanners and finishers of leather, in nearly all its most useful forms. As Professor Wilson reports on tanneries, it is requisite only to remark, that in fancy-varnished leathers, and in morocco, the surface, finish, and elasticity are generally of a high character.

Morocco cloth.

In connection with the material of morocco leather, it may be as well to notice here an important invention already alluded to in Class XI., under the name of Leather Cloth. This is a most perfect imitation of morocco, by the application of a preparation of caoutchouc, or gutta percha, to the surface of plain woven or twilled cotton cloth. The surface is corrugated in imitation of morocco, and is coloured and varnished so as to present all the external appearance of that kind of leather. The elasticity is perfect, showing no tendency to crack, and so far as time has at present tested its durability, this appears to be satisfactory. Its cost is less than one-third that of morocco, and from the width of the cloth, it cuts to much greater advantage in the covering of articles of furniture, for which, as well as carriage linings, particularly railway carriages, it is coming largely into use. Time did not permit of a visit to the manufactory of the patentees, Messrs. J. R. and C. P. Crockett, at Newark, New Jersey, but specimens of the fabric have come to hand recently, which fully confirm the opinions above given; but it is now stated, that after a trial it has not been found to answer for the lining-band of hats, to which it was at first applied, as the colouring matter is decomposed by wear, from the surface not possessing the absorbent quality of leather.

As the trade in raw hides and the manufacture of leather must, from the extent of the latter, form a most important item in the productions of the United States, it is to be regretted that, up to the present time, the census returns for 1850, in this department of industry, have not been made public.

CLASS XVII.

PAPER, PRINTING, TYPES, BOOKBINDING, &c.

Paper manufacture.

The manufacture of paper is carried on to a great extent in most of the Atlantic States, but unfortunately the census returns, so far as published in a collective form, do not contain the statistics of this important branch of trade, which must have increased to a great extent within the last few years, as the quantity of printing papers alone consumed in the United States must be immense.

The whole production is by machinery, not more than one or two houses making hand-made papers. The machines are all adaptations and improved applications of Fourdinier's invention, modified to suit the wants or ideas of the manufacturer, who would appear to be the stationer also, as far as the making up of the paper into reams, quires, and packets is concerned, and its distribution to the retail trader, even in the ornamental form in which it reaches the public. In this respect the general commercial dealings in paper are very different to those of England, and the function of the wholesale stationer is an exceptional one in the United States.

Paper mills in the State of Massachusetts.

The State of Massachusetts would appear to be largely engaged in the manufacture of paper. At Lee, Berkshire County, in that State, there are 19 paper mills, employing a capital of about $200,000 (about £50,000 sterling). In Norfolk County, Massachusetts, there are 17 mills, and in Worcester County, 15 mills, employing a capital of £100,000 sterling in this manufacture. In 1845, up to which date the last general statistical information on the State of Massachusetts is published, there were 89 paper mills, consuming 12,886 tons of materials, and making 4,765 tons, giving 607,175 reams of paper per annum, the value of which was $1,750,373 (about £430,000 sterling), and employing 1,369 operatives; and this certainly gives no exaggerated view of the general position of the paper trade in nearly all the New England States, New York, New Jersey, and Pennsylvania, at the present date.

Materials used in the manufacture of paper.

The materials used are chiefly raw cotton and mill waste. Linen rags are imported from Europe, but the principal consumption would appear to be cotton, either as above named or in rags. The general character of the printing paper is of a low quality, with a very small amount of dressing or size. In writing papers the make is quite equal to the general run of European papers, but the finish is not always so perfect. It is stated, however, that whilst the Americans try to imitate the English finish, the latter are trying to imitate that of makers of the United States.

Wall papers for hangings.

A considerable number of paper mills are engaged in the manufacture of wall papers only, for printing as hangings. These vary in quality, but are chiefly of the coarser and cheaper kinds; and as there is a constantly increasing demand in this branch of the paper trade, the manufacture extends rapidly.

Ivanhoe mills, Paterson, New Jersey.

The Ivanhoe Mills, Paterson, New Jersey, has the reputation of being the most complete establishment of its kind in the States. This manufactory is erected on the Canal, by which the head water of the Passaic Fall, on the Passaic river, is converted into mill power.

The buildings are admirably arranged, and whilst every department, from that for the reception and picking of the rags and cotton waste, to the making up of the paper, is complete within itself, the whole is so connected as to be perfectly progressive; thus economising labour, and preserving the orderly arrangement and cleanliness of the whole establishment.

Book papers.

Book papers only are manufactured, and two sets of operatives are employed, one for night and the other for day; so that the works always go on, except on the Sabbath.

There are ten vats or engines for grinding the materials for making the paper. These are larger than those generally used in England, and this appears to be the rule throughout the United States. Each vat contains pulp sufficient for making 180 lbs. weight of paper. In England they usually contain 120 lbs. only. The bleaching of the material is effected in a number of air-tight chambers of large size, built of stone, with iron doors, the whole so constructed that no chlorine can escape.

Paper machine, Ivanhoe mills.

The paper machine at work in the Ivanhoe Mills is one of great accuracy and beauty, wood framing being avoided as much as possible in the construction, and bright brass substituted. The whole has a clean and elegant appearance, with perfect freedom from rust; whilst the action is firm, smooth, and steady.

Carew paper mill, South Hadley, Massachusetts.

Writing papers.

If the inspection of this establishment was satisfactory as to the mechanical and economic arrangements, and the excellence of the book-papers produced, a visit to the Carew Manufacturing Company's Paper Mill, South Hadley Falls, on the Connecticut river, Massachusetts, showed that the older mills were quite equal to the production of the first qualities of writing papers, though the internal arrangements might be less consecutive and complete than those of the Ivanhoe Mills. The Carew Company's papers are firm, well-finished examples of the best class of writing papers, pure in colour, and well glazed. The pressing is chiefly effected with steam-heated cylinders covered with paper, through which the sheets pass in quick succession, and a very good surface is obtained.

Roller pressing.

Contrivance for cutting the sheets.

The cutting of the paper into sheets is effected by a very simple but ingenious contrivance. A knife is set in the wheel round which the paper revolves as it leaves the machine; a flat board, swinging on a pivot, comes in contact with the edge of the knife at stated intervals, thus measuring off the sheet and cutting it at the same operation. The sheets fall into a receptacle below the revolving cutter, and are removed at stated intervals as they accumulate.

The water used in the Carew Mill is not from the Connecticut river, from which the power is obtained, but from an artesian well sunk in the rock on which the mill is built. The water is of great purity, and the supply is most abundant.

It has been already stated that the paper manufactures of the United States fulfil the functions of the wholesale stationers of England. Of this the Carew Company are an example. In the above mill the paper is made, cut into sheets, pressed, the edges cut and gilt, ruled by machinery when required, and made up into reams, quires, and packets, in such covers as the retail stationer to whom it is supplied may require; the styles of making up being more or less imitative of those adopted in Europe.

Wrapping papers.

The wrapping papers of the United States are of great variety, both as regards quality and colour.

Envelopes.

Envelopes are usually made of a light buff-coloured paper; but the chief portion of the fancy stationery at present used would appear to be imported from Europe.

Book printing.

The printing operations are extensive and well conducted, particularly in bookwork. The printing of newspapers alone forms a large item in the industry of the country. In the New England States, according to the Abstract of the Census of 1850, there were 424 newspapers; in the Middle States, 876; in the Southern States, 716; and in the Western States, 784; and the following table shows the daily, weekly, and monthly issues and aggregate circulation, as given by the above authority:—

Number of newspapers published in the United States in 1850.

	Number.	Circulation.	Number of copies printed annually.
Dailies	350	750,000	235,000,000
Tri-weeklies	150	75,000	11,700,000
Semi-weeklies	125	80,000	8,320,000
Weeklies	2,000	2,875,000	149,500,000
Semi-monthlies	50	300,000	7,200,000
Monthlies	100	900,000	10,800,000
Quarterlies	25	29,000	80,000
	2,800	5,000,000	422,600,000

German newspapers.

With an educated people, taking a vital interest in all public questions, the newspaper press is likely to increase even in a greater ratio than it has done during the past decade. The number of German emigrants has caused the establishment of newspapers for their use, and at Cincinnati alone there are four daily newspapers published in the German language.

Type-founding.

Type founding is carried on to a great extent at Boston, New York, and Philadelphia, and there are single establishments in several other of the large cities. The whole of the type used in the United States, besides a large quantity exported to the British provinces and the various States of South America, is produced in these foundries, and the statements made in the Report of the Jury for Class XVII. in the Great Exhibition of 1851, appear to be so far correct, that a reference thereto will be sufficient for all practical purposes here;* and the same may be said with reference to the sketch of the progress of the paper manufacture, given in the same Report.†

Boston type foundry.

Machines for casting type.

At the type foundry of John K. Rogers and Company, Boston, Massachusetts, machines for casting the smaller bodies of type are in regular use. A pump is used for forcing the melted metal into the mould, and a workman turns out 90 brevier type per minute, and smaller kinds at a more rapid speed. This machine, or an adaptation of it, is in general use in the type foundries of the United States, and some few have been lately exported to England.

The larger kinds of type are still cast by hand in the usual way.

Ornamental type.

Ornamental type is not manufactured to any great extent; the forms, however, of the ordinary bodies are neat and elegant, with a clearly-cut edge. The metal used is an alloy of lead, tin, and antimony, each preponderating according to the type required; 75 per cent. of lead, however, is stated as the average of that metal.

Stereotype plates in gutta percha at the Smithsonian Institute, Washington.

Stereotyped titles for catalogues of libraries.

The use of gutta percha for the purpose of stereotype appears to have been extensively experimented upon in the United States; and at the Smithsonian Institute, Washington, a method invented by Mr. Josiah Warner, of Indiana, has been adopted for the purpose of realizing a plan suggested by Professor Jewett for stereotyping catalogues by means of separate titles. The titles of the books to form the catalogue being set up in any convenient number, a matrix is made therefrom, and a stereotype plate cast in gutta percha. This is sawn into the number of titles of which it is composed, and the alphabetising is accomplished by the simple assortment and arrangement of those titles, which are fixed together in the requisite pages. By this means the books added to any library during the year may be inserted in their proper places, and an annual catalogue published at a comparatively small cost, containing all the recent additions to the library.

It must be evident that the gutta percha plates, thus divided into titles, might be used for the formation of matrices from which to cast metal titles, if such are desired. All the practical difficulties in the way of the realization of this plan have been, it is now believed, overcome, and the Smithsonian Catalogue may be shortly expected to illustrate the practical benefits to be derived by public libraries in the adoption of the plan above described.

Specimens of type in the Exhibition at New York.

The few examples of type sent to the Exhibition are good, being generally of pure and tasteful forms, and remarkably clean in the casting.

Combination type.

There are specimens of combination type, exhibited by the manufacturer, Mr. John H. Tobitt, of New York. There is generally, amongst practical printers a great antipathy to change the form and arrangement of existing "cases;" and, however plausible a plan of combination types, in which a word or portion of a word can be "set up" at a single operation, may be, the single "body" has still the advantage in one important point,—that if damaged, a letter only is lost, instead of a whole word, if but a single letter of which it is composed is injured.

Bookbinding.

The specimens of bookbinding exhibited do not call for any special remarks. They are of the usual character, so far as the external appearance is concerned, and the style of gilding and the taste displayed in the decorations are altogether based on European modes: a redundancy of unnecessary ornamentation being the leading feature, as in England.

Account books.

In commercial account books the workmanship and finish are generally excellent.

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* Jury Reports, 8vo. edition, page 410.

† Idem, page 443.

Of stationery and paper the display is very limited, and the show cards and labels, exhibited as specimens of ornamental printing, are of average merit. Stationery.

CLASS XVIII.

PRINTING AND DYEING.

In the operations of printing and dyeing the fabrics manufactured of cotton, wool, and a combination of the two, the manufacturers of the United States have been largely aided by the emigration of artizans from Europe, who taking with them the experience gained by the almost unremitting attention which has been paid to these important departments of industry during the past half century in England, France, and Germany, have been enabled to establish on a firm foundation the commencement, at least, of an invaluable adjunct to the manufacturing processes in woollen and cotton goods, now so successfully carried on for the supply of the demands of the American population. Printed and dyed fabrics.

The introduction of calico printing has been one of no ordinary difficulty, consequently the results have been of slow growth, and accompanied by many failures. It would appear now, however, to be fairly established; and although dependent in a greater degree probably than in almost any other branch of industry upon the imported skill of British workmen, either as designers, engravers, or printers, yet the tact of the American is nowhere seen to greater advantage than in the steady and skilful devotion of his energies, both manufacturing and commercial, to the development and progression of a trade requiring more than ordinary skill to conduct with pecuniary profit. The fluctuations of fashions, the uncertainty of the style likely to prevail in the market, from the influence exercised by European goods,—the adaptation in colour and quality to an almost endless variety of market,—all contribute to place the beginner at no slight disadvantage; and this applies to a nation as well as to an individual. Introduction of calico printing.

No means present themselves for obtaining a statement of the quantity of cotton cloth printed in the United States. The two largest concerns of this class, however, are the Merrimack Print Works, belonging to the Merrimack Manufacturing Company, Lowell, Massachusetts, and that of Messrs. Jacob Dunnell and Company, Pawtucket, near Providence, Rhode Island. The latter was the first establishment of the kind in the United States, and the production of the two concerns amounts to 30,000,000 yards per annum.

Messrs. Dunnell's Print Works are erected on the banks of the Pawtucket river, and the internal arrangements are excellent as regards the economy of human labour, and the scientific application of the best known and thoroughly established modes of calico printing. Messrs. Jacob Dunnell, and Co., Providence, Rhode Island.

In cotton both madder and steam prints are produced, jaconettes and cambrics, under the generic name of lawns, form a considerable portion of the madder work. Mousellines de laine are also printed in considerable quantities when they are in demand; but latterly this firm has found that steam prints or all wool (de laine) fabrics have been preferred by the class of buyers whom they supply. Steam prints, which have been somewhat out of favour, were again in demand in certain markets, chiefly in the Southern States, and these, though all within the boundary of the Federal Union, require special styles to suit them. Showy patterns, large in form, and strong in contrasts of colour, are those chiefly sold in the South and West. In the Middle States, especially in New England, smaller patterns, more subdued in colour, and approaching to the best character of goods used in England, are required. In fact, in these latter States the neat madder prints find their chief market. Madder and Steam prints. Printed lawns. Mousellines de laine. Printed goods suited to different parts of the United States.

The print shop at Messrs. Dunnell's is very lofty and well arranged, and contains ten machines, all of which are usually at work. In steam prints as many as ten colours or tints have been produced in one pattern: the average is four, and the result is, as usual, more satisfactory. The machines are run at much greater speed than in England, in order to make up, as far as possible, for Print shop at Messrs. Dunnell's.

the higher rate of wages paid in the States. Thus, the workman having more hours to work, and a greater quantity of work to get through and be responsible for, has his attention ever on the stretch to avoid the production of bad work. The average amount got through is 12,000 pieces per week.

Dye-house at Messrs. Dunnell's.

The dye-house arrangements are within a very small space, considering the work got through.

Untwisting machine.

An ingenious contrivance for untwisting the cloth as it comes from the dye-house is in successful operation, by which one boy does the ordinary work of six men. This untwisting machine receives the cloth through a wooden funnel, similar in shape to the hopper of a mill, into a trough of the width of the fabric, forming an inclined plane. The boy attending to the machine assists the opening of the cloth, which is chiefly effected by an undulatory motion, applied as it descends from the funnel; this partial spreading out is rendered more complete by the passage of the fabric over the curved edge of a piece of wood, across which it is drawn on the ascent up the inclined plane or trough, which conducts it to a series of wooden rollers with spiral edges of brass fixed in their surface. These open the cloth completely, in a similar manner to the iron spreading roller attached to every calico printing machine.

An adaptation of a French method of using the chloride is adopted. This is effected by passing and wringing the cloth in its open state through the chloride, or "chemick," as it is called in England, and then washing out by passing over three large wooden cylinders placed above each other, over which an abundant stream of water flows as they revolve. The wringing out of the water by other cylinders leaves the cloth perfectly free from all excess of dye and chloride, and it is then dried and folded from the machine.

The drying process is conducted in a very economic manner, by a contrivance somewhat similar to the ordinary washing machine used after bleaching.

Economy in using steam.

The steam is also economised to a very considerable extent. It is first worked at high pressure, then taken off at 10 lbs. to the square foot for bleaching purposes, and then again at 1 lb. to the square foot for heating the decoctions of dyestuffs. By this means little or no steam is lost, and the saving is said to be about 33 per cent. in fuel over the English method. No steam was visible in the bleach-house, whilst in bleach-houses generally, the upper part is full; and, of course, this is all waste.

Earthenware bleach rings.

The earthenware bleach-rings mentioned in Class XXV., page 59, are used in both the bleach and dye house.

The goods printed by Messrs. Dunnell bear comparison with most of the same class printed in Europe. The steams are clear and bright in colour; the madders, especially the lawn fabrics, clean and well finished; the prints being generally pure and of excellent tint.

English designers and printers.

The designers and printers employed by this firm are nearly all Englishmen. French designs on paper, together with the current styles in cloth, are obtained from Paris; but it often happens that if any of these are produced as soon as obtained, they are too early—in fact, too novel for the home market. Thus a pattern printed one season and unsuccessful from its novelty, has sold well in a subsequent season requiring the same class of goods, the importations from Europe having made the buyers acquainted with the style. For it is a singular fact, that however much these buyers are supposed to give the fashion, and thus rule the market in America as in Europe, their principles of judgment or taste, as it is called, are so low as rarely to enable them to pronounce whether a pattern is good or bad until it begins to sell, or they find it hanging upon their hands. It has thus happened that a style pronounced totally unsaleable, has in a subsequent, or possibly a more advanced period of the same season, become quite the rage. These are points upon which the calico printer has to calculate, if he can do so, alike on both sides of the Atlantic.

Uncertainty of fashion.

Sale of printed goods.

The goods printed by Messrs. Dunnell are brought into the market by a great sale at auction in New York, at the commencement of each commercial season. All are cleared out at a blow, and this plan appears to have answered their purpose most admirably. The buyers at once take the responsibility of making the goods sell; the printers are left free to attend to their productions for another season, without the necessity of selling out a dead stock at the end of the current year. This appears to be a bold and original course, suited more to the purposes of the American market than consistent with the commercial notions and usages of European manufacturers.

Merrimack print works, Lowell, Massachusetts.

At the Merrimack Print Works, Lowell, Massachusetts, madder colours only are printed. There are twelve machines employed upon these, printing in from one to four colours, and the daily produce is 40,000 yards, or about 8,000 pieces per week. The goods printed are manufactured in the cotton mills of the same Company (see Class XI.). These are of excellent quality, and the character of the printing and dyeing places them on a par with similar fabrics manufactured elsewhere.

The patterns are generally well selected, being of a neat character and similar, in many respects, to the goods known in England as "Hoyles." The smaller kind for children's wear, are especially noticeable for the same qualities, which render the prints of such houses as Hoyles and Liddiards so much in request in England; and when it is considered that this class of calico print is largely used in the United States for the summer clothing of males, especially for boys, the demand would appear to be far beyond the present means of supplying it.

The Merrimack Company, as also Messrs. Dunnell and Company, contribute largely to the Exhibition at New York, and the goods there displayed, though simply selected from their ordinary productions, are characterised by the qualities already indicated.

Quality of water for dyeing and printing.

The water of the Merrimack river appears to be better adapted to the dyeing of cotton than of woollen. This point claimed particular attention at Lowell, from the comparison of the colours dyed for carpets by the Lowell Manufacturing Company, and the dyes at the Merrimack and Hamilton Print Works; and the impression was confirmed on examining the dyes of the cottons and de laines printed at the Manchester Print Works, Manchester, New Hampshire. On mentioning this to the manager of the works at the latter place, he confirmed the opinion I had formed on this point. This question of the selection of a water site for dyeing and printing is a most important one in the United States, since it is quite certain that in no country is there a great variation in this respect.

Hamilton Manufacturing Company, Lowell, Massachusetts.

The Hamilton Manufacturing Company, Lowell, dye and print a large quantity of the goods manufactured by them. The dyed goods are chiefly for the China market, and the home market of the West. These consist of drills, and are usually blue or brown. The average weekly produce in this department amounts to 36,000 yards.

The prints are all madders in from one to six colours, and the weekly work of the five machines employed is returned at 110,000 yards.

The styles of the patterns are generally darker than those of the Merrimack Company, but are good examples of madder work.

The internal arrangements of both the Merrimack and Hamilton Print Works are very good as regards economy and facility for work, but do not call for any special notice.

Manchester print works, Manchester, New Hampshire.

At the Manchester Print Works, Manchester, New Hampshire, both cottons and mousellines de laine are printed; the goods being manufactured by the same Company (see Class XV.).

Ten machines are employed, and these print from single-coloured madders up to eight colours in steams, six colours being the average in mousellines de laine.

The cottons printed here, however, are nearly all madders, the designs being of the usual character; about 500 pieces (15,000 yards) being the average weekly production.

Mousellines de laine.

In mousellines de laine, 15,000 pieces (45,000 yards) are printed weekly, and the patterns are mostly of a season later than those of Europe, for reasons already given as affecting the sales. The designs are adapted to the markets, which are chiefly in the Northern and Western States, and the styles are generally showy, rather than elegant.

Scouring grey de laines.

The printing department is well arranged, and the scouring of the grey de laines is now attended to more than it formerly appears to have been, from the quality of some of the colours. Seventeen machines are now used, where formerly eight were considered enough; and the absolute cleanliness of the fabric before printing, seems to be recognised in its full force,—a fact that the scientific printers of France discovered years ago, but which British as well as American printers paid in costly failures for finding out.

Cloth-folding machine.

A folding machine, for grey cloth, is attached to the dyeing machine of the scouring room. It consists of a swing frame with rollers, through which the cloth passes. As the frame swings on a pivot, by which it is attached to the upper part of the frame, it lays out the cloth as it descends from the rollers in smooth and even folds, ready for carrying to the printing machine, instead of allowing it to be crushed into an unsightly mass as it passes from being dried in the grey.

In printing, the pieces are run up from the machine to drying-rooms, descending again to the machine for examination by the printer. The de laines are folded and carried to the steam, but the cottons are run up to "ageing" rooms, from whence they are in due time run off again to the dunging and dye vats. Carrying about by human labour is thus saved to a very great extent, and a cotton piece is scarcely touched by hand, from the time it enters the machine until it is dyed and has to be untwisted from the wringing after dyeing.

Economical use of steam.

The steam here is economized as much as possible. A small steam-engine is attached to pump the condensed water back into the boilers. Thus water at 120° to 140° temperature is used instead of cold water, and fuel is saved by not allowing the already heated water to run away in waste.

Hamilton Company's print works, Southbridge, Massachusetts.

Time did not allow of a visit to the Hamilton Woollen Company's Print Works, Southbridge, Massachusetts, but the agent of this Company, in common with those of the Merrimack and Manchester Company, and Messrs. Jacob Dunnell and Company, furnished me with duplicate patterns of the goods contributed by them to the Exhibition at New York. These are good specimens of mousellines de laine. The colours are clear, brilliant, generally well selected and harmonised; the patterns partaking of the usual character. A specimen of cashmere furniture, printed with copper rollers, in the chintz style, in ten colours, is admirable, in the clearness and distinctness of the large masses of colour. The design is of the floral type usually adopted for furnitures.

Printed cashmere furniture.

English and Scotch designers.

The Hamilton Company's Works print about 20,000 yards per week, having four machines at work, and another in the course of erection. They retain four designers, three Scotch and one English, and these produce nearly all the patterns they use.

Engraving of copper cylinders.

A department for the engraving of copper rollers or "shells," as they are generally called in the United States, is attached to each print works, in which the requisite patterns are engraved, and the workmen employed are chiefly Englishmen.

Invention applicable to the use of copper cylinders in calico printing.

As an improvement in the use of the ordinary rollers and the mandril, an invention has been lately patented, as applicable to the use of copper shells, by which a great weight of copper may be saved by making the shell itself very much thinner, and inserting therein another roller with a grove or slit running longitudinally, into which a mandril is fitted with a metal notch running down the slit, thus expanding the internal roller to the full circumference of the inside of the copper shell, and rendering the whole sufficiently firm and solid for use in the machine. The value of this mode of using copper cylinders in printing has, however, yet to be tested. The saving in the weight of copper at present employed will be considerable if the invention succeeds, and the necessity for "turning off" a pattern will be also superseded, and a standard circumference may be adopted for the cylinders, with a gain in the comparatively small amount of metal required to constitute the thickness of the "shell."

Printed table covers.

Felted table covers of a good quality are printed at the Bay State Mills, Lawrence, Massachusetts. These are entirely blockwork.

Printed silk handkerchiefs.

Silk handkerchiefs, of India fabric, imported in the grey, are printed at the Falls of the Schuylkill Print Works, near Philadelphia. Specimens of these are displayed in the Exhibition at New York, and show good work.

Printed goods exhibited at the New York Exhibition.

The specimens of printed goods exhibited are, on the whole, fairly representative of the present state of this branch of industry in the United States, and evince progress of no ordinary kind.

Printed cassimeres and satinettes.

Printed and "extracted" cassimeres and satinettes for trouserings and vestings is a novelty, and the specimens exhibited, as also those produced by the Middlesex Company, Lowell, are calculated to give a favourable impression of the character of this mode of dyeing woollen goods for general use. European prejudices would undoubtedly be against such modes of finishing the surface of such materials; but in the United States a novelty of this kind, commended by cheapness and fair appearance, readily finds appreciation, or, at least, obtains a trial of its merits.

CLASS XIX.

CARPETS, &C.

Carpet manufacture.

The manufacture of carpets appears to have been of steady growth. Commencing with the cheaper and more useful kinds, or, at least, those most in demand, it has progressed until it now forms a very important item in the industry of the United States.

Domestic system of weaving in Pennsylvania, Delaware, and Maryland.

In the New England States, where it is carried on to the greatest extent, the weaving may be said to be altogether by power. Hand-loom weaving, however, is still the chief means of production in the States of Pennsylvania, Delaware, and Maryland, and the manufacture consists of two and three ply Kidderminster, Venetian, and a little Brussels. The out-door or domestic system, as it may be called, prevails to a considerable extent, although there are factories in which looms are set up. One of these at Philadelphia has generally from 200 to 300 at work, and the proprietors employ out-door weavers in addition. This system has already been alluded to in Class XI., as applied to the manufacture of checks, tickings, &c. The weaver takes out work from the manufacturer, and the master weaver, or "boss," as he is called, employs other weavers to work, probably three or four looms, in a shed attached to his own house. He is responsible to the manufacturer from whom he receives the materials, and to whom he delivers the work when completed, and receives payment, giving such wages to his workmen as leaves him a small profit for superintendence, use of looms, &c., supposing the latter are his own property, which is frequently the case. In fact the system pursued in the States above named is similar to that which still exists in some of the manufacturing districts of England, except that the American "boss"* is a nearer approach to a small manufacturer making up the materials of another.

Wages of hand-loom carpet weavers.

The wages of the working weavers vary from $8 to $12 per week, the average being about $10—say £2 1*s.* 8*d.* sterling. This rate is given on the authority of a carpet manufacturer at Philadelphia, and one of his master weavers.

Rag carpets.

The rag carpets manufactured by the prisoners of the Maryland Penitentiary, Baltimore, have been already mentioned when reporting upon the other industrial productions of that prison.

Lowell Manufacturing Company, Lowell, Massachusetts.

The Lowell Manufacturing Company, Lowell, Massachusetts, manufacture carpets very extensively, employing 200 power looms, producing 25,000 yards per week. The goods consist of two and three ply ingrain, and are good fabrics of their class, being firm in make and excellent in dye, so far as permanence of colour is concerned. In some colours, too, there is much clearness and brilliancy, but, as already stated (Class XVIII.), the water of the Merrimack appears better adapted to the dyeing of cotton than of wool. The designs are varied, and of the usual character of such goods.

Designers for carpets.

The designers employed are French and Scotch. Two female students of the Boston School of Design are engaged, who, after a fair trial, and the requisite technical instruction, have been successfully employed in "drafting." They have also made one or two very creditable attempts in design.

Tufted and chenelle rugs.

Tufted and chenelle rugs also form a part of the productions of the Lowell Company's Carpet Works, about 50 per week being manufactured.

Thompsonville Manufacturing Company.

A very complete establishment for the manufacture of carpets of various kinds is situated at Thompsonville, Massachusetts, erected and worked for a considerable period by the Thompsonville Manufacturing Company. The works, however, had not been in operation for several months at the date of my visit.

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* The term "boss" is also generally used in the United States instead of "master" or "employer."

The specimens of goods shown were of a fair quality; the arrangements of the engine-house, mill, weaving-rooms, dye-house, &c., being very complete, and of a most substantial character. When in work, 27 carding engines are employed. There are 127 power looms for ingrain carpets, turning out, when at work, from 25 to 28 yards each per day; and 7 power looms for Venetians, usually making 125 yards each per day. The hand looms comprise 42 for Brussels, 10 tufted rug looms, 16 setting Axminster, and 4 filling looms. This establishment being about to pass into other hands, would in a few weeks from the period at which the above information as to its capabilities was obtained, be again in operation; but great difficulty was anticipated in getting together the requisite number of skilled operatives, as those formerly employed have sought and obtained employment in other districts.

Difficulties in obtaining skilled operatives.

In this respect the American manufacturer is peculiarly situated, and he must often carry on his business at little or no profit, perhaps at a considerable loss, in order to keep together the agents by which, when the demand comes, he can alone supply it. Hence the anxiety to settle down the operatives around the mills; to render their condition and social position such as shall absolutely attach them to their employers and the locality. The latter, perhaps, being the most difficult, from the migratory tendencies of a people so restless, and always so alive to any new contingency which promises to better their condition, however distant the field of operation may be.

Bigelow Carpet Company, Clinton, Massachusetts.

Power-loom Brussels carpet.

The most interesting carpet manufactory in the United States is, without doubt, that of the Bigelow Carpet Company, Clinton, Massachusetts. In this establishment the manufacture of Brussels carpets by power is fully and completely carried out, and a fabric manufactured, which, for evenness of surface, fineness and strength of make, is of a most unexceptionable character.

There are 30 power-looms always in full work, weaving 5-frame Brussels carpet. The production of each is from 20 to 24 yards per day; in special cases 32½ yards are manufactured. Pieces of 60 yards each, of the widths ¾, ⅞ and 1 yard constitute the usual make. The "fit" or "register" of the patterns is of the most accurate character; thus giving a great advantage in the making up.

The weavers are all females, one attending each loom.

The dyes are excellent, the water being obtained from wells sunk for the purpose. Its quality is evidently favourable to the more brilliant colours, the reds and blues being especially clear and bright.

The designs are of the usual character, chiefly floral, though a few good geometric diapers indicated a tendency to a more healthy style. The patterns are generally well drawn and coloured, and are of European production.

Power-loom velvet pile Brussels carpet.

An experiment was going on in a new loom, or rather a new application of the present loom, in the manufacture of velvet pile. By an arrangement of the wire, a knife-blade, with the edge uppermost, forms one end, and when this is drawn out by the action of the machine it cuts the pile. In order to secure the face-threads, two picks had to be thrown into the back for one at the face of the fabric, and the problem in the course of solution was the relative proportion of these threads. The results of the experiment were so far satisfactory as to show that success was certain, and that when once the splitting or division of the pile, by the tension occasioned by the back threads being too thick, was accomplished, a beautiful fabric would be the result. The produce of the experimental loom was about 15 yards per day, and it was anticipated that this would be the average in the other looms in course of construction.

Printed felt carpets.

The printed felt carpets manufactured and printed at the Bay State Mills, Lawrence, Massachusetts, are remarkable examples of their class. The patterns are generally well selected, and suitable to the fabric, the colours good, clear, and brilliant; whilst the printing is more accurate in fit than is usually found in this class of goods. These felted carpets sell at 90 cents (say 3*s.* 9*d.* sterling) per yard of 2 yards wide.

Carpets in the Exhibition at New York.

The carpets exhibited in the New York Exhibition are of a very miscellaneous character, many being imported. Those of American manufacture, however, are generally such as above stated; the best being "ingrain."

Floor-cloths.

The manufacture of floor-cloth appears to be one in which, ultimately, the Americans will succeed, so far, at least, as the use of the materials are concerned; the dry character of the atmosphere being very favourable to the rapid drying of the work.

There are a few admirably printed specimens in the Exhibition, but, with the exception of one pattern, in imitation of oak *parquettage*, they are as thoroughly wrong in design, and as antagonistic to everything like the true principles of floor decoration, as the generality of such things are in England. For instance, one specimen has its surface ornamented with a portrait of Washington, and a view of Mount Vernon alternating in panels, surrounded by a wreath of flowers and the American Engle! Yet this is intended for a floor-covering, and of course to be walked upon!

False principles in design.

Coach lace is manufactured in considerable quantities in some of the New England States.

Coach lace.

The Clinton Manufacturing Company, Clinton, Massachusetts, have 100 looms employed in the production of coach lace, the materials being varied according to quality, and consisting of, more or less, worsted, cotton and silk. The designs of some of the best qualities, in which silk is freely used, are very good. The looms are of the same construction as the Brussels power loom; in fact, the latter is an extension of the principle of the coach-lace loom, since the invention was first applied to the manufacture of coach lace.

Clinton Manufacturing Company, Clinton, Massachusetts.

The manufacture of fringes, tassels, &c., appears to be exceptional (see Class XX.), but the specimens contributed to the New York Exhibition are, generally of fair make.

Fringes, tassels, &c.

Embroidery appears to form but a very small item in the industrial productions of the United States, although in the Exhibition there are numerous contributions of ladies' work, chiefly in Berlin wool and embroidered quilts.

Embroidery.

The specimens of commercial embroidery are generally good, and in New York, as in other large cities, persons are employed by the various millinery and upholstery establishments in needlework decorations for articles of dress and furniture.

CLASS XX.

WEARING APPAREL, &C.

As might be expected, the manufacture of ready-made clothing forms an important item in the industry of the people of the large cities of the States, such as New York, Boston, and Philadelphia, and that, in a country where male labour is in such demand, females are more largely engaged, and, on the whole, better paid for their work than they are in Europe. Still, during the last summer, attention has been called to the condition of the needlewomen,—especially the shirt-makers of New York, and facts brought to light of a parallel character to those which a few years ago formed such prominent points in an inquiry into the industrial and social position of the same class of females in London.

Clothing, &c.

Condition of needlewomen in New York.

The general statistics of the clothing trades, spread, as the various occupations connected therewith are, over the whole country, presented so many difficulties that, after several attempts to obtain accurate information on this point, I was compelled to abandon it. There can be no doubt, however, that could accurate data be obtained, the result would be of a very extraordinary character; as in a country where all classes of the people may be said to be well dressed, and where the cast-off clothes of one class are never worn by another, the manufacture of the cheaper kinds of clothing must be carried on to an enormous extent.

Cincinnati, Ohio, appears to be a great central depôt of ready-made clothing, and its manufacture for the Western markets may be said to be one of the great trades of that city. The system pursued is that chiefly of outworkers. The articles of dress being cut out in large quantities in the warehouses of the dealers or manufacturers, and distributed to those who undertake to make them up at their own houses, or to master tailors or "bosses," who, paying the hands they engage either by the piece or by the day, undertake the making up of large quantities of clothing. The various sewing operations are

Manufacture of clothing at Cincinnati, Ohio.

Sewing machines.

carried on by the latter in workshops, in most instances well adapted to the peculiarities of the trade, and latterly sewing machines, of varied construction, have been largely employed. In one of these establishments, the manager or "boss," stated that a person skilled in the use of the machines in operation there, would do as much work as ten ordinary needlewomen, and that by those in which the needles acted vertically, any character of seam required for ordinary clothing, either in right lines or curves, could be sewn. The successful action of this machine is further exemplified in the manufacture of boots and shoes, so far as the stitching of the upper leathers is concerned.

Manufacture of clothing in the Western States.

At Louisville, Kentucky, and St. Louis, Missouri, the manufacture of clothing is also extensively carried on; but Cincinnati may be considered as the great mart of ready-made clothing for the Western States, and, in a measure, for those of the South also. In 1851 there were in the latter city 108 establishments, employing 950 hands in their own workshops, and upwards of 9,000 females, either at their own homes or under "bosses." The proprietors are chiefly German Jews, and most of the operatives are Germans.

Under-clothing.

Under-clothing, as made up from the piece, such as shirts, &c., is manufactured upon the same system, and mostly by the same firms. This applies generally throughout the larger cities.

Stocking-net, hosiery, &c.

The manufacture of stocking-net, and of hosiery of the coarser qualities, is gradually developing itself in various localities, especially in the States of Connecticut and Massachusetts.

Waterbury Knitting Company.

The Waterbury Knitting Company, Waterbury, Connecticut, manufacture cotton drawers, under shirts, and merino wool knitted articles. By a regulation of the directors, however, strangers are not allowed to see the machinery; but judging from the character of the goods, the machines are, in all probability, either of French construction, or upon the same principle as the circular looms of Jouve or Gillet. The former has a patent right for the United States, which is held by the Enfield Manufacturing Company, Thompsonville, Massachusetts. This establishment is under the direction of an Englishman, Mr. W. G. Medlicott, and 400 operatives are employed. There are 3,000 spindles for cotton yarns, and 13 sets of carding engines for wool. The company has at work 58 circular knitting machines of various dimensions, after the invention of Jouve, of Belgium, for which, as above stated, it holds the patent right, and 23 machines made by François Gillet, of Troyes, France. The articles produced are knitted cotton drawers, under-shirts in cotton, cotton and wool, and all wool. All these are of fair average quality and make.

Enfield Manufacturing Company, Thompsonville, Massachusetts.

Circular knitting machines.

Elastic webbings, uspenders, &c.

Messrs. Hotchkiss and Merriman, Waterbury, Connecticut.

Elastic webbings used in the making up of clothing, suspenders, gaiters, &c., are manufactured in the State of Connecticut, and the establishment of Messrs. Hotchkiss and Merriman, Waterbury, affords an illustration of the extent and mode of operation. There are several other concerns of a similar character, but this appears to be the largest. They spin the cotton yarn in one factory where 200 persons are employed, manufacture the buckles and metallic mountings in another, and at a third factory the elastic webbing is produced; the threads of caoutchouc for intermingling with the warp being prepared on the premises, the weaving of the weaving being effected by power. About 150 persons are employed in the latter factory, where the webbing is afterwards cut to the requisite sizes for the various articles into which it is to be made up, the leather trimmings punched out to the proper forms, and then assorted into convenient quantities with the necessary metallic appendages. The materials thus prepared and assorted are distributed in the villages and farm-houses around, to be made up by females, in many instances at their hours of leisure from domestic employment, and by others as a means of obtaining a livelihood. Even little children, under the age at which the law of the State allows of their employment in manufactories, can be usefully engaged in some portions of the work thus undertaken at home. A waggon is used for sending round the materials and collecting the finished work. This visits a given district at stated periods, taking out fresh work and bringing back that distributed on the former journey. About 600 persons are thus employed at their own houses by Messrs. Hotchkiss and Merriman.

Domestic employment in making up elastic fabrics.

The goods are made up into dozens and half-dozens, and usually packed in ornamental boxes for distribution to the retail dealer. They consist of the commoner kind of such articles as used in England, but are of excellent make and quality.

It will be seen that the method pursued in the making up of these articles is similar to that adopted in Scotland and the north of Ireland by the embroidery houses of Glasgow and Belfast.

Boots and shoes.

The boot and shoe trade of the United States is of a very extensive character, and the systematic manner in which it is carried on worthy of being understood and adopted elsewhere. A scale or series of sizes is adopted, say in women's and childrens' shoes from 1 to 6, and even higher numbers, the half constituting a size between each. The various portions of the boots and shoes are cut out to these sizes and half sizes. These are put up with all the requisite trimmings necessary to complete the articles, in sets of 60 pairs for the common kinds, and 24 pairs for the finer qualities.

System of manufacture of boots and shoes.

Being cut out and made up into sets, they are sent to be "fitted" for the maker—that is, the various parts of the upper leathers are stitched together. Much of this is now done by one of the various kinds of sewing machines in which the needle acts vertically, as the force required to pierce the leather is more directly applied than in those in which the needle acts horizontally or in a segmental curve. The neatness, accuracy, and strength of stitch is superior to hand work. The upper leathers thus "fitted" are then sent to the "binder," who finally prepares them for the "maker," by whom they are soled and heeled. Being complete in make they then go to the "trimmer," whose work consists in punching the string holes, stringing and putting on buttons, and in ladies' shoes, bows, rosettes, &c.

Cutting out sole leather by machinery.

Soles are cut out by machinery. A knife with a curvilinear edge is set in a frame and worked with a treadle after the manner of a lathe. By a lateral motion in the machine it can be adapted to the cutting of any requisite width of sole, and being once fixed to a given width, the process of cutting is very rapid, and material is saved by the leather being cut at right angles to the surface, instead of diagonally as by the ordinary knife.

When finished the goods are made up in boxes containing 1 dozen of assorted sizes. They are then sent in cases to the wholesale dealer who supplies the retailer. A case contains 5 boxes, making up the 60 pairs of assorted sizes of which a set of the commoner kind consists as manufactured.

Boots and shoes are manufactured and the workmen reside in all parts of the New England States, but chiefly in the States of Massachusetts, Maine, Vermont, and New Hampshire.

Gentlemen's boots.

Brogans, or negro shoes.

The finer quality of boots for gentlemen are chiefly made at Randolph and Abington, Massachusetts; the heavier kind of shoes, and the coarsest kind, usually called "brogans," at Danvers, in the same State. These "brogans" are chiefly manufactured for the Southern markets, for the use of slaves, and are similar to the shoes worn by the miners of South Staffordshire.

Ladies' and children's shoes.

Shoes for females are chiefly made at Lynn, Reading, Woburn and Havrehill, all in the State of Massachusetts.

The following table, compiled from the "Statistics of the Condition and Products of certain branches of Industry in Massachusetts, for the year ending April 1st, 1845," will show the extent of the boot and shoe trade in the six above-named towns at that date:—

Amount of production in boots and shoes, 1845.

Towns.	Kinds.	Number of Pairs Made.	Males employed	Females employed.
Randolph . . .	Boots . . Shoes . .	227,131 332,281	815	649
Danvers . . .	Both . . .	1,150,300 . .	1,586	980
Lynn	Boots . . Shoes . .	2,000 2,404,722	2,719	3,209
Reading . . .	Shoes . .	274,000 . .	358	385
Woburn . . .	Boots . . Shoes . .	909 350,920	425	484
Havrehill . . .	Shoes . .	1,860,915 . .	2,042	1,680

At the last-named town 129 machines were employed in cutting sole leather.

Lynn, Massachusetts.

Lynn is still the town most extensively engaged in this trade, and, as regards the methods of business and routine of manufacture in the article of ladies' shoes, an extract from the report of the Sanitary Commission of Massachusetts, 1850, is here quoted.

Time required to convert stock into boots and shoes.

"It requires, on the average, about sixty days to convert stock into articles ready for final sale; and, in the process several classes of persons are employed. The head manufacturers furnish the capital, and superintend the whole operation. The warehouses or stores of the better class generally contain, 1. A counting room, where the general business is transacted; 2. A leather room for keeping the soling leather; 3. An upper stock room; 4. Two clicker's or cutter's rooms, one for the upper leathers, and one for the 'stuffs,' or soles; 5. The bound shoe room; 6. The trimming room; 7. The sales and packing room. A 'last' room, and others of less importance, are also sometimes provided.

System of preparation.

The stock is put into the hands of the 'clickers,' who cut it into 'sets' of shoes, varying somewhat in number and size, from 28 to 50, No. 2 to 7, according to the size and quality of the stock. These sets are numbered, recorded, and packed in boxes, to be sent to the operatives or workmen, to whom they are charged. When returned, they are credited, and go into the trimming room, where they are finally prepared, by females, for market. They are afterwards taken to the sales-room and packed. Generally the sets, as they go from the cutter, are kept together until their final sale. These shoes are sold at the warehouses of the manufacturers, and are seldom or never consigned.

"The 'closing' and binding of the shoes is done by females or 'binders,' and the other parts, or 'bottoming' by males, or 'workmen,' 'jours,' or 'journeymen.' These operatives do not live in Lynn exclusively, but many of them reside in other parts of the State, and in Maine, New Hampshire, and Vermont.

Wages of boot and shoe makers.

The binders receive from 2 to 5 cents per pair for children's shoes, 3 to 5 cents for misses', 3 to 9 cents for ladies' shoes, and 6 to 12 cents for gaiter boots. The workmen receive for bottoming, or making shoes, 5 to 17 cents for children's, 10 to 20 cents for misses', 10 to 25 cents for ladies, and 15 to 33 cents for gaiter boots. All the labour is paid for by the piece. Idle time here receives no compensation, and none need be spent. Full employment can always be obtained by competent workmen. The binders earn from \$3 to \$4, and the workmen from \$3 to \$9 per week, according to inclination, ability, and time employed (the latter averaging about \$5), out of which they pay their board, which in Lynn is \$2 to \$2½ for males, and \$1¼ to \$1¾ for females. The net earnings of the females are about half as great as those of the males. The females seldom bottom the shoes, though they might very properly do it.

"Some of the workmen manufacture small lots of shoes on their own account, which they sell to other manufacturers, or have shops, in which they let to other workmen or journeymen 'berths,' or the right to place and use their 'kits.' These shops are commonly small buildings in a yard near the dwelling-house, or rooms in the barns. The price paid for a berth is \$1 50 cents, \$3, and sometimes \$5 annually, according to accommodations, the inmates agreeing to share equally in the expenses of warming the rooms. The chips of their work are saved when fuel is not needed, and burned with wood in box stoves, open at top, when it is needed; and, in many shops, these chips supply nearly half the fuel. Very little coal is burned."

A return, of which the following is an abstract, was kindly furnished by Mr. Alonzo Lewis, of Lynn, who has devoted special attention to the statistics of the manufactures of that place. This shows the present state of the boot and shoe trade in that locality.

Statistics of the boot and shoe-trade of Lynn.

Shoe manufacturers—men who manage the business and employ workmen	167
Cutters—men who cut the shoes and shape from the stock	321
Cordwainers—workmen who make the shoes	4,132
Binders—females who bind the shoes	7,170
Number of pairs of shoes of all kinds made 1852-53, including women's and children's shoes, boots and gaiters	4,952,300

Value .. \$3,706,000, say £900,000.
Capital employed 1,500,000, „ 375,000.

The boot and shoe trade, as carried on in the United States, is altogether of a domestic character, although, from the methods adopted, it partakes of the essential features of a well-regulated factory system. The character of the operatives stands very high for intelligence and probity, and such is the confidence of the manufacturers that they never ask for a reference, still less for a security, when a new hand applies for work; and instances of the loss of materials by the dishonesty of the workmen are very rare indeed. Sets of shoes have been lost occasionally through intrusting them to travelling shoemakers, who afterwards proved to be professed vagabonds; but this has never yet affected the integrity of the workers generally.

Character of the operatives.

For the convenience of the operatives residing in distant localities, the materials, in their prepared state, are collected from the manufacturers by express-men or carriers. These deliver them to the workman for whom they are intended, and on receiving the work made up, delivers that to the manufacturer, and then receives the payment due to the former for their labour. The remuneration of these carriers is generally a small per centage on the amount.

Distribution of th materials.

The "brogans" or "negro shoes," are often made by small farmers, who fill up their leisure time with shoemaking, especially in the winter, when outdoor labour cannot be attended to. The ready-money thus obtained contributes very materially to the comfort of this class of persons, and they pride themselves upon paying the State taxes when they are proprietors, and a great portion, if not the whole, of their rent when tenants, with the proceeds of their handicraft.

Domestic manufacture.

The examples of boots and shoes contributed to the Exhibition at New York are very numerous, and illustrate in a satisfactory manner the skill and ingenuity employed in this department of industry. The taste displayed in the ladies' shoes is very considerable, whilst the excellence of workmanship, especially in gentlemen's boots, show how thoroughly the division of labour which prevails in this manufacture is favourable to satisfactory results.

Boots and shoes exhibited at the New York Exhibition.

The manufacture of hats, in all the varieties of wool, fur, silk, and cotton felt, is largely carried on in the States of New York, New Jersey, and Connecticut. Time did not permit of any examination into the methods and processes of manufacture, but in all probability these differ very little from those of England and France. No statistics, as to the extent of the hat trade could be obtained without much personal inquiry, but there is no doubt this department of industry has increased enormously during the past eight or nine years, and that great improvements have taken place in the quality and style of the hats manufactured. There is a highly satisfactory display of specimens of almost every kind of hat produced in the United States in the Exhibition at New York, and all, or nearly all, of these present unexceptionable evidence of skill in manufacture, and considerable taste in the style and finish.

Manufacture of hats.

Hats in the Exhibition at New York.

The straw bonnet trade gives employment to a large number of persons in New York city as sewers, as also in several distinct localities in the New England States.

Straw-bonnet trade.

The straw braid or plait is chiefly imported from Italy, France, Germany, England, Switzerland, and China, and embraces nearly every quality; the latter (Canton straw) being largely used for the Southern markets, which are chiefly supplied by the New York manufacturers. "Swiss lace" has been latterly in the greatest demand for bonnets, and the importations of the other kinds have been proportionably less. A coarse straw is obtained from Canada, which is chiefly used for the manufacture of men's hats.

Imported straw braid or plait.

The domestic manufacture of straw braids or plaits is almost exclusively confined to the New England States. These consist principally of split straw, narrow and fine, and almost equal to the English. Also, of a small proportion of Devon, a wide straw braid of an inferior quality, and of single 11, and other braids in smaller quantities and of inferior qualities. The English "patent" and "whole" straw have been imitated in New England, but with little success.

Manufacture of straw braids or plaits.

In the manufacture of bonnets, besides the New England States and New York city, a little is necessarily done in nearly all the large cities. Palm-leaf hats, for men and boys, are made up at Worcester, Massachusetts, and other parts of New England, in large quantities. The "Shakers," in several of their communities, manufacture a close cottage bonnet of the same material.

Manufacture of straw bonnets and palm-leaf hats.

The number of straw hats made up in New York has been estimated at upwards of 1,000,000 per annum, and there are probably from 2,000 to

Straw-sewers, New York city.

3,000 sewers engaged in making up straw hats during the season, the average wages of which are probably $3½ (about 15*s.* sterling) per week. The work is done either at the homes of the workers or in workrooms provided by the employers, according to the system adopted by the latter; in some instances, both "in" and "out" workers are employed. The same complaints of unremunerated labour, as already quoted in the case of the shirt-makers, are made by the straw-sewers, and the relation of this class of female operatives to their employers is very similar to that which exists in London and other large cities.

Bonnets exported from England.

The bonnets exported from England would find a much readier and more extensive sale in the United States, if style of make was more attended to, and more of the elegance found in the French thrown into their manufacture. As it is, the best houses procure their styles and patterns from Paris, and these are imitated, as far as possible, in the making up of the imported braids by the New York sewers.

Southern markets for straw goods.

In the Southern markets the demand for straw goods is continuous throughout the year, owing to the warmth of the climate; in the Northern States, however, it is chiefly confined to the spring and summer.

Value of straw goods imported and manufactured.

The value of the importations in straw goods, that is, in the braid or plait, and made up, has been estimated to amount to $4,500,000, or about £1,000,000 sterling, and the value of those of American manufacture to about $500,000, or about £110,000 sterling.

Military clothing and accoutrements at the Exhibition at New York.

The demand in the United States for military clothing and accoutrements is very great, from the extent to which the formation of volunteer corps is carried, and the trade thus created is an important one.

The military costumes exhibited at New York are of a very varied character, the contributions of Messrs. Horstmann and Sons, of Philadelphia, being the most important. The varied manufactures of this house ought, strictly speaking, to be classified under the heads of Class XIII., Silk, in which the ribbons, &c., have been already alluded to; Class XIX., Lace, and Class XX., Clothing (that now under consideration), as also Class XXII., Ornamental Metalwork. For convenience, however, it is placed here, because the exhibits are under this head in the Exhibition at New York, and the chief productions are military clothing and accoutrements.

Messrs. Horstmann and Sons, Philadelphia.

Gold lace, silk fringes, and braidings.

The manufactory of Messrs. Horstmann is the most complete of its kind in the United States. In the weaving department, gold lace, silk fringes, bindings, &c., are woven by power in looms to which, as required, the jacquard machine can be applied, as already stated (Class XIII.), for the manufacture of ribbons. Hand looms are employed in the manufacture of braiding. Machines of beautiful construction are used for covering cords with silk and gold thread, and by a proper adjustment these produce a pattern on the surface of the cord. As the work done is of a very high character, as regards quality and make, the speed of the machinery is much slower than usual, a low-pressure engine supplying the power.

Military ornaments.

The manufacture of military ornaments forms another department. Electro-gilt brass ornaments, sword-handles, scabbards, and the usual bullion decorations, being produced on a very extensive scale. The sword-blades are all imported, chiefly from Germany.

Messrs. Horstmann are the recognised manufacturers of military equipments to the War Department at Washington, and the military clothing, &c., contributed to the Exhibition at New York are of a very high character, alike as regards design and execution. Having recently erected a very large and well-arranged factory within the city of Philadelphia, the whole establishment presents an example of system and neatness rarely to be found in manufactories in which handicrafts so varied are carried on. Female labour is, of course, largely employed in the weaving and making-up departments, and formerly in the cutting of fringes. This, however, is now performed by a machine with a circular knife, so arranged as to cut the thread on the diagonal. The double fringe as it leaves the loom, being either run off the beam or placed upon a roller for that purpose, is divided much more exactly than it could be by hand, and at so rapid a speed a scarcely to admit of a comparison with hand labour. Any width of fringe can be thus cut, the machine being so constructed as to be easily adapted thereto.

Fringe-cutting machine.

IRON AND OTHER METAL MANUFACTURES.

INTRODUCTION.

Iron manufactures. Introduction.

The present extent and future prospects of those manufactures already fairly established in the United States in which iron is the principal material used, required a much more extended and detailed examination than time and the distance to be travelled over would permit of my devoting to them, when taken in connection with other departments of industry requiring equal attention. The progress of the past ten or twelve years would appear, on all hands, to have been very great; and many establishments which were scarcely commenced at the beginning of that period, are now in a position to stand a fair comparison with similar manufactories in England.

Pennsylvania is the largest iron producing State in the Union, although by the census of 1850, twenty-one States are returned as producing pig iron, and only two, Florida and Arkansas, as not having establishments for the manufacture of iron castings; whilst in nineteen States wrought iron is made.

Pig iron.

In the production of pig iron 377 establishments were in operation in 1850, and of these 180 were in Pennsylvania, 35 in Ohio, and 29 in Virginia; the remaining 18 States having a much smaller number each.

Capital invested in the manufacture of pig iron.

The capital invested amounted to $17,346,425 (about £4,500,000 sterling); the produce being 564,755 tons per annum, employing 20,298 males and 150 females.

Iron castings.

In the manufacture of iron castings, 1,391 establishments were engaged. of these 643 were in the States of New York and Pennsylvania,—323 in the former and 330 in the latter; 183 others being in the State of Ohio. The capital invested amounted to $17,416,361, or about the same amount sterling as in the manufacture of pig iron. 322,745 tons of castings are produced per annum, giving employment to 23,541 males and 48 females. The value of the castings, and other products, being estimated at $25,108,155, or about £6,250,000 sterling.

Quantity and yearly value of iron castings.

Wrought iron.

Wrought iron is manufactured at 422 establishments in 19 States. Pennsylvania has 131, New York 60, New Jersey 53, Tennessee 42, and Virginia 39; the remaining 97 being situated in 14 other States. The capital invested was $14,495,220 or about £3,500,000 sterling; 13,178 males and 79 females being employed. The quantity manufactured amounted to 278,044 tons, the value of which, with other products, was $16,747,074, or about £4,100,000 sterling.

Quantity and yearly value of wrought iron.

There can be no doubt that a very considerable increase has taken place in the make and manufacture of iron since the returns, from which the above facts were taken, were made in 1850; and from the energy, enterprise, skill, and industry of all concerned in this manufacture, and the importance attached to it as a permanent source of national wealth and prosperity, its future progress cannot fail to be more than commensurate with that of the last few years.

Miscellaneous articles in iron and brass.

The manufacture of articles of utility in metal, especially iron and brass, is chiefly carried on in the States of Connecticut and the cities of Philadelphia, Pittsburg, and Cincinnati, as also to a very considerable extent in Boston, New York, and Baltimore, in all the departments connected with ship building and heavy machinery.

The manufacture of the lighter articles in metal appears to be chiefly located in the State of Connecticut, in the valleys of the Naugatuck and Housatonic; the mills and manufactories being built on the banks of those rivers and the smaller streams running into them, from which the requisite power is derived to drive the machinery employed. Thus, those natural advantages which presented themselves for the promotion of manufacturing enterprise in the cotton and woollen trades in the larger streams of the New England States, such as the Connecticut and Merrimack rivers, are equally obvious in the smaller streams of the State of Connecticut, and have been as readily seized upon for the establishment of a variety of metal trades in which, in addition to skilled handicraft, a large amount of highly ingenious machinery is constantly and most successfully employed. These various trades will be considered under their respective heads.

CLASS XXI.

CUTLERY AND EDGE TOOLS.

Cutlery.

Waterville Manufacturing Company. Waterbury, Connecticut.

The present position of this department of manufacture can only be illustrated, with one exception, by consideration of the contributions to the Exhibition at New York, since time only permitted of a visit to a single manufactory —that of the Waterville Manufacturing Company, near Waterbury, Connecticut. At this establishment pocket cutlery only is made.

Pocket cutlery.

About 100 workmen are employed, and amongst them a few Sheffield workmen. Nearly all kinds of the pocket cutlery, of the best qualities, are made, and the taste displayed in the forms and general getting up of the goods is excellent. The materials, more especially the steel, used being of the best quality, the goods, of course, correspond; and from their excellence in temper as well as in finish, are in constant demand.

The factory is very systematically arranged, affording every facility for the economic production of the articles manufactured. The stock of materials of all kinds constantly kept on hand is necessarily large, as there is no possibility of obtaining a supply on any sudden emergency, as no similar establishment is to be found within a considerable distance. Everything is, therefore, as far as possible, made upon the premises, and portions of pocket-knives, the making of which, in England, almost constitute trades of themselves, are here produced in the ordinary routine of business, owing to the isolated position alike of the manufacture as of the manufactory.

Pocket and table cutlery at the Exhibition at New York.

The pocket cutlery displayed at the Exhibition at New York is generally of good quality and tastefully got up, and to the specimens of table cutlery the same remarks apply.

Edge tools.

Screw augurs.

In the larger kinds of edge tools there are some admirable illustrations of the extent to which the manufacture of these useful articles is carried on, and of the attainment of a high degree of excellence, both in material, workmanship, and finish. Screw augurs and augur-bits of graduated sizes, patent expansion-bits which set to any size, and sundry carpenters' and other tools, all displaying either improvement in construction or excellence of finish and make.

Button-hole cutter.

A button-hole cutter of ingenious construction, with a guage to measure the size of the button-hole, and two or three assortments of tailors' shears, are admirably adapted to the uses for which they are intended, the finish being unexceptionable.

Axes, adzes, hammers, &c.

The largest and most extensive display of edge tools is made by the Collins Manufacturing Company, Hartford, Connecticut. These consist of axes, adzes, &c., together with hammers of various sizes, pickaxes, and the ordinary run of heavy tools. Other houses exhibit hammer-heads of good workmanship and material.

Files.

The imperfect manner in which, from the cause already assigned, this department of industry in the United States was examined, is to be regretted, as from the examples shown at the Exhibition, its successful prosecution is apparent, so far at least as the more useful articles in constant demand in such a country are concerned. That a considerable number of European workmen are employed in this manufacture would appear to be more than probable, as the finish of the articles often shows an amount of skill only attainable through long practice. In the manufacture of files, for example, the best workmen are nvariably Englishmen.

CLASS XXII.

IRON, BRASS, AND GENERAL HARDWARE, INCLUDING LAMPS, CHANDELIERS, AND KITCHEN FURNITURE.

Manufactures in iron.

Cast-iron elevations for buildings.

In nearly all the large cities, iron foundries of greater or less extent are to be found, cast-iron being largely employed in the construction of buildings both of wood and brick; and in Philadelphia, as also to some extent in other cities, whole elevations of houses, used as retail shops in the principal streets, are of cast-iron. In these cases the construction of the building is usually modified to suit the material of the front, and, in some instances, an approximation is made towards adapting the decorative part of the elevation to the material and the construction. In general, however, the ordinary architectonic forms, as used in stone and wood, are followed, and the whole painted and sanded in imitation of Connecticut red sandstone, a material now much used in building. The construction of some of these elevations is at once simple and effective, alike for strength as architectural effect, and there appears to be very little difficulty in taking out an old front and substituting a new one, as the whole is well braced together by tyes and screws—the side walls sustaining the structure in all essential points. In Philadelphia there are some admirable examples of this adaptation of cast-iron to architectural purposes, and others were in the course of construction, in which more or less of originality in the matter of design and decoration is attempted. For retail shops of several stories where light is an object, and heavy pieces of masonry tend to lessen the size of the windows, these cast-iron elevations appear to be peculiarly well adapted. The dryness of the atmosphere, however, presents a great advantage, from there being less tendency to oxydization than in a more humid climate. It would appear probable that this use of cast-iron will eventually produce a style of street architecture, as applied to retail shops, of a different character to that which now prevails, and which is in imitation of European modes alike of construction and decoration.

Ornamental iron-castings.

Ornamental castings for architectural purposes, such as balustrades, railings, &c., are produced in large quantities in New York, Boston, Philadelphia, and other large cities, and these are usually copies or adaptations of similar work made in England. A few manufacturers aim at originality of design, with a greater or less degree of success.

Mr. Robert Wood's foundry, Philadelphia.

Garden decorations.

At Philadelphia, the garden decorations, ornamental cast-iron work for cemetries, monuments, &c., manufactured at the foundry of Mr. Robert Wood, are good examples of their class. One or two verandas and garden fountains were very superior in design to the ordinary run of such things, being well adapted both to the material and the purpose for which they were intended. Mr. Wood was engaged in the production of a cast-iron statue of the late Henry Clay, 15 feet high, to be placed upon a Doric column of the same material, about to be erected by the citizens of Pottsville, Schuylkill county, Pennsylvania,—a work requiring no ordinary amount of skill in moulding, &c.

Messrs. Chase, Brothers, and Co., Boston, Massachusetts.

Iron railings.

The ornamental and decorative iron castings of various kinds produced at Boston, Massachusetts, may be illustrated by those manufactured by Messrs. Chase, Brothers, and Company, as these are fair types of the best class of work, both as regards execution, skill, and the application of art to the embellishment of the useful, to which this firm has paid more than ordinary attention, and that too with some success, when the difficulties in obtaining good and workable designs are taken into consideration. The iron railings manufactured by them are of a very superior character, both as regards the construction and decorative arrangements of the parts, a few being more severe as regards geometric quantities and architectonic adjuncts than would be considered commercially prudent by many English manufacturers; and the severity of style would in all probability really militate against their sale, where exuberance of ornamentation is considered an essential. Some of the articles of garden furniture and decoration are also good, but, in general, the ultra-natural types, so much used in

Garden decorations.

Umbrella-stands, hat and coat-trees.

Europe, are followed in all their absurdity. This is observable too in the umbrella stands, and hat and coat trees, not only of this house, but of all the others of which time permitted an examination.

Iron bedsteads.

The iron bedsteads, manufactured by Messrs. Chase, are fair average examples, and are of a similar kind to those manufactured in England. The peculiar talent of the inventors of the United States does not appear to have been much directed to those useful articles of furniture, in which so wide a field still lies open for an improvement, alike in construction as in decorative adjuncts. Brass is scarcely used as a mounting, and the method of japanning is susceptible of a more than ordinary amount of improvement.

Toilet mirror-frames.

The pernicious system of covering ornamental iron castings with dark green paint, and rubbing the projecting parts with metallic powder, in imitation of bronze, is, of course, as rife in the cast-iron articles of the United States as in those of Birmingham and Sheffield. In toilet mirror-frames, too, made of cast-iron, woods and metals of all kinds are imitated. Occasionally a manufacturer sets himself against these "shams," and insists upon the sensible course of either black-leading or blacking with black bituminous varnish, gilding a moulding or rosette here and there, but never suggesting any other material than that of which the article is really composed.

Cast iron mantel-pieces.

The manufacture of cast-iron mantels for fireplaces, in addition to stoves and grates, is largely carried on in various localities. The mantels produced by the rival Marbleized-iron companies at New York are certainly very remarkable and exceedingly useful articles of their class. These are covered with a preparation of enamel, the report on the application of which, however, belongs to the class of Mineral Manufactures (Class XXVII). The decorative effect of these substitutes for the more costly material of marble is very good. Some of these cast-iron mantels, as produced by the manufacturers of grates and stoves, are merely japanned black, and being carefully got up are admirable in point of workmanship, and the distribution of the material to the points requiring the greatest amount of strength; and, except when elaborate ornamentation is attempted, the designs are pure and architectonic, though perhaps the latter might be objected to as tending to conceal the real nature of the material.

American stoves.

It is probable that, after the castings for millwork and machinery, the greatest weight of metal would be found to be consumed in the manufacture of the ordinary stoves used for domestic purposes. These stoves are peculiar in their construction, being chiefly adapted to burn wood as fuel, though many of them will also consume coal. They are at once the warming apparatus and kitchen ranges of the great mass of the people, and the varieties are almost innumerable, any improvement in construction being usually the subject of a patent. The manufacture of these articles may be said to be distributed all over the United States; but there are certain localities in which they form an immense staple trade.

The New England States and the State of New York may be said to supply their own wants, as also some of the North Western States, and the British provinces. Philadelphia and Baltimore manufacture stoves for the Southern and South Eastern portion of the Union; Pittsburg, Pennsylvania, and Cincinnati, Ohio, supplying the demands of the Western and South Western States. These latter affording a wide field for inter-emigation, the wants of the settlers create a constant demand in the two last-named cities, both of which, from their favourable position as regards the supply of raw material and fuel, together with ready means of transport throughout the whole of the Mississipi and Missouri districts, have the supply of the markets of the West. One house at Pitsburgh now manufactures 10,000 stoves per annum, having given up every other branch of the iron casting trade to devote attention to the production of stoves and tea-kettles only.

It is estimated that at least 20,000 stoves per annum are manufactured in Pittsburg, and 50,000 in Cincinnati.

Designs for stoves.

The patterns or designs of the various houses differ very much. Some of the enterprising obtain designs from, and even have patterns modelled in Europe; and they register, or rather take out a patent right for the design, which can be done apart from the question of construction. Piracy is, of course, complained of, as also invasions of patent rights in construction. Much ingenuity is often displayed in the arrangement of the parts of a stove, and the adaptation of the decoration to strengthen and sustain those portions requiring the greatest amount of metal. Great efforts are made after novelty, alike in construction, ornamentation, and in name, for every stove has a distinct title by which it is known in the market; and the euphony of some of these is often more amusing than appropriate. Except for office stoves and those required for public buildings, European designs are not generally so well adapted to the use of the ordinary article as the less ornate but more common-sense designs of the Americans. There is, however, a wide field for a better style than as yet prevails, and as an absolute necessity exists for a certain amount of decoration of surface alike to strengthen the panels, sustain the angles, and hide defects in casting, which would be too apparent on a mere plane surface, the ornamentation adopted often partakes of the character of an excrescence rather than of a decorative adjunct.

Cast-iron stand for a news-room.

Generally the designs of cast-iron articles manufactured at Cincinnati, are superior in point of fitness to those of Pittsburg, since the latter are of a more conventional and antiquated character; and it is more than probable that the large number of Germans settled in the former city, influence in a large degree the character of its productions in this respect. One of the best and most original productions in cast iron which came under my notice in the United States, was the side of a newspaper-stand in the public reading-room of the Young Men's Mercantile Library Association at Cincinnati. It is constructed of a well-arranged perforated ornament, admirably adapted to the support of a double desk or "lectern," upon which the newspapers are placed for perusal. It was manufactured by Messrs. Horton and Macy, of Cincinnati. The general character of the productions of this firm in stoves, grates, &c., is superior in point of taste to much of the same work done in England, except in very costly articles. Unfortunately no opportunity presented itself for an interview with the principals of this house, owing to the limited period devoted to the manufactures of Cincinnati as compared with the time required to do them full justice, or the number of European, as compared with American workmen in their employ, would have been ascertained.

General character of cast-iron work.

Nails.

Bar, hoop, and sheet iron.

The general character of the cast-iron work of the United States is admirable, alike for the purity of surface in the material, and the skill shown in the moulding. The iron being in many instances smelted with charcoal, is of a firm quality and closer grain, so to speak, than that used for similar work in England. Hence the castings produced are sharp in detail and even in surface, and require a very small amount of dressing or filing to complete them. The character of the charcoal-made iron is shown in a remarkable degree in the quality of the wrought-iron nails manufactured at Pittsburg. These are exceedingly tough, bend like wire, and are very different from the brittle articles of a similar class usually produced in England. There are 14 or 15 establishments for the manufacture of nails in the above city, producing from 8,000 to 10,000 kegs of 100 lbs. weight each, giving about 1,600 tons of nails per week. The manufacture of bar, hoop, and sheet-iron, and iron-wire, is also carried on in four or five of these manufactories. About 2,500 workmen are employed, and the value of the produce is upwards of $4,000,000, or about £1,000,000 sterling.

Foundries at Pittsburg, Pennsylvania.

There are about 30 large foundries and many smaller ones at Pittsburg, employing 2,500 operatives, and consuming 20,000 tons of pig iron annually in the manufacture of various castings.. The produce of these foundries is estimated at about $2,000,000.

Tacks.

Tacks of copper, zinc, and iron, hob-nails, and rivets, are also manufactured at Pittsburg by Messrs. Campbell, Chess, and Company. These are produced by machinery, and the articles are well and clearly made with good points and well-formed heads. All the ordinary sizes are made in iron and copper; but only the larger sizes in zinc, as the friability of this metal appears to be unfavourable to the manufacture of the smaller kind.

Locks, latches, and door furniture.

The manufacture of locks, latches, door furniture, &c., is also largely carried on at Pittsburg; and the Novelty Works of Messrs. Livingston, Roggen, and Company, and the Excelsior Works of Messrs. Edwards, Morris, and Company, illustrate this department of industry.

Novelty works, Pittsburg, Pennsylvania.

Locks, latches, and bolts.

In the Novelty Works 450 workmen are employed, of these 150 are moulders and casters. The character of the small castings produced in this establishment is excellent, and very little filing is required in the fitting of the various parts of the articles together. Locks, latches, and bolts are manufac-

"Janus" lock for hotels.

tured in great variety, chiefly of a comparatively cheap kind for the supply of builders in the West. A cheap, simple, and ingenious lock, chiefly for bedroom doors of hotels, is manufactured here. It has two bolts and two keyholes, but there is no connection between them. Thus, the lock cannot be opened except from the side on which it is locked.

Scale beams and platform scales.

Scale beams, platform scales (Fairbank's patent), for counters, railway offices, &c., are also manufactured in large quantities and of good quality.

Paint and coffee-mills.

Paint and coffee mills of various kinds and of a cheap character, the latter being fitted into wooden boxes, form a very important item of business; 450 dozens of coffee mills being made every week.

Excelsior works, Pittsburg, Pennsylvania.

At the Excelsior Works similar articles are produced, but not to the same extent. About 150 workmen are employed, and the general run of work is the same as at the Novelty Works, except that each has contrivances in locks, latches, and fasteners, peculiar to itself.

Extension spindle for locks.

A lock with a wrought-iron extension spindle, to adapt it to the varied thickness of doors upon which it may have to be fitted, is a clever and useful invention as made at the Excelsior Works. It consists of a perforated plate acting upon angular notches cut into the spindle; the plate being easily screwed at the requisite distance indicated by the thickness of the door upon which the lock has to be fixed.

Messrs. Greenwood and Company, Cincinnati, Ohio.

Probably the most extensive, and certainly the best conducted and most systematically arranged establishment, for the production of miscellaneous hardware articles in the United States, is that of Messrs. Miles Greenwood, and Company, Cincinnati, Ohio. In addition to foundries for large castings common to nearly all establishments of this class, the manufacture of the smaller cast-iron articles is fairly and successfully established, and most of those coming under the denomination of "builders' hardware," which a few years ago were almost entirely supplied from England, are now produced here in immense quantities, to supply the constantly necessary requirements of the Western States.

Builders' hardware.

Butt hinges.

In the important item of butt hinges there can be no doubt of the great superiority of those manufacted by Messrs. Greenwood, alike as regards the general qualiity of the metal as in the adaptability of strength or weight of material to size. In the finish of the joints great accuracy is obtained, whilst the labour of filing is saved by grinding the joints of the hinges on stones adapted to the purpose, and driven by steam-power. About $15,000 or $20,000 worth of these butt hinges are produced yearly.

Domestic hardware.

Most of the hardware articles for domestic use, usually manufactured by a large class of the hardware establishments of England, are also made here; and the general finish of the articles is certainly of a superior character, except where more than an ordinary attempt is made at ornamentation, and then the results are by no means satisfactory.

Malleable cast iron.

Malleable cast iron is also manufactured by Messrs. Greenwood into a great variety of articles usually made of wrought iron. These consist of braces or bit-stocks, screw-wrenches, bed-keys, chest-handles, gun-mountings, saddlers' ironmongery and coachware, kettle-ears, thumb-screws, nuts, &c., and have the reputation of being very excellent substitutes for the more costly wrought-iron articles.

Sheet copper.

Native copper.

Works for the smelting and rolling of copper for use in manufactures have been established on the banks of the Monongahela river, near Pittsburg, by Messrs. G. H. Hussey and Company. The ore is from Lake Superior, and is conveyed from thence by way of Cleveland on Lake Erie to Pittsburg. It consists of large solid masses of native copper, cut with a cold chisel, for convenience of transport, into pieces weighing from 3 to 4 cwt., and is often of great thickness. It is also found in "pearls" or washings, of very good quality. The copper, when smelted, is cast into bars and ingots, or rolled into sheets, and in these forms is sent to the various seats of manufacture in the United States. Messrs. Hussey have one furnace constantly employed in reburning the "slagg" of former refinings, from which they obtain 2½ per cent. of copper.

Copper tubes for steam boilers. Stamped cooking dishes.

In addition to preparing the copper in sheets and bars, copper tubes for steam boilers and cooking dishes, adapted to the stoves so extensively used for domestic purposes, are also manufactured. The latter being tinned inside after the manner of ordinary hollow ware, form durable and useful utensils.

The great abundance of coal in the neighbourhood of Pittsburg gives it great advantages in the smelting of ores, and in those manufactories in which mineral fuel is an essential. Its cost is $1½ (about 7*s.* sterling) per ton.

Metal rolling and wire drawing.

The rolling of metals into sheets, and drawing into wire, is carried on to a very considerable extent in New England, and silver, copper, brass, and German silver are thus prepared for use in various manufacturing localities in those States. At Waterbury, in the State of Connecticut, which may be said to be the centre of the various manufacturing towns and villages of the valley of the Naugatuck, the final preparation of metals for manufacturing purposes forms an important branch of industry. Connecticut, as a State, is considered as the chief seat of the metal toy and and tin-ware trades; and, although the manufacturing villages and establishments are spread at irregular distances along the banks of the Connecticut, and in the valleys of the Naugatuck and Housatonic rivers, the aggregate of industry is very considerable, and is largely on the increase from year to year.

Waterbury, Connecticut.

Waterbury and its trades may be taken as a fair specimen of the manufacturing towns and villages alluded to, and is said to have been the seat of the first button manufactory established in the United States. From this has arisen other analagous trades which could be readily carried on in the same establishment, often by the same or similar machinery, or by the same operatives.

Scovil Manufacturing Company, Waterbury. Buttons.

Punching machine.

The Scovil Manufacturing Company now carry on the manufacture of metal buttons as fairly established, some forty years ago, by the Messrs. Scovil. The buttons of this house are good examples of the kind of goods in demand in America, and are chiefly manufactured by machines invented and constructed upon the premises. One machine for punching out the blanks for spherical buttons and raising them to the required convexity in one operation, does its work at the rate of 280 buttons per minute; whilst another machine, fitted with six punches, strikes out 1,800 plain blanks in the same space of time. An ingenious machine is also employed for "milling" the edges of the ordinary plain gilt buttons, and does the work of 10 or 12 girls.

Milling machine.

Military buttons.

The military buttons manufactured in this establishment, as also the general range of ornamental articles of the same class, are in better taste than the generality of similar goods produced in England. Less effect is aimed at, and extravagant subjects in high relief are avoided; most probably from a want of dexterity in sinking the dies. The results, however, are much more satisfactory than those arising from the misdirected ingenuity which too frequently characterises the ornamentation of the same kind of articles as produced by the English manufacturer.

Like many other branches of industry, the button trade of the United States has had great difficulties to contend with at the outset, from clashing with certain supposed commercial interests; and even now, unless the American manufacturer can afford to fix a price which will allow a large margin of profit, as compared with European products, the merchant prefers obtaining his supplies from England, France, or Germany.

Automaton shanking machine.

A beautiful automaton machine for shanking buttons has been lately introduced by the Benedict and Burnham Manufacturing Company, Waterbury, and is in operation in their wire-drawing establishment, being the invention of a mechanic in their employ. The blanks being cut in thin brass, are put into a curved feed-pipe, and descend by their own gravity to the level of the machine. Each blank is carried by the machine under a punch which stamps out the centre hole. The shank is made below by another portion of the machine, from a continuous wire carried along horizontally. From this, the wire to make the shank is cut off and bent, being pushed up at the instant the blank, with the centre hole stamped in it, comes in a vertical line therewith. Another punch descends with a hole in the centre, to allow of the doubled wire forming the shank to go into it, and this gives the blank the requisite concavity and forces the brass tightly round the wire, after which another punch, with a wedge-like edge, descends and opens the wire, spreading it within the concavity, and thus the back of the button is completed. The machine does this in the most perfect manner, at the rate of 180 or 200 per minute. All that is required of the attendant is, to feed the tube with blanks, and when one coil of shank-wire is exhausted to supply another. It is impossible to conceive anything more complete in its way than the machine at work at the period of my visit.

Two or three others were in the course of construction, and in a more or less complete state.

Florentine buttons.

Florentine buttons, and tufts for upholsterers, and covered nail buttons, in silk and Utrecht velvet, are also manufactured at Waterbury.

Daguerreotype plates and mountings.

The extensive use of the Daguerreotype in the United States has created a great demand for the plates, metal mountings, or "trimmings," as they are technically called, connected with the cases in which the pictures are fitted. The plates for the pictures are invariably manufactured of British copper, as being more perfectly refined and possessing a more even and sounder fibre than the native copper, therefore better adapted to this purpose, where evenness of surface is indispensable. The Scovil Manufacturing Company, whose productions in buttons have been already quoted, carry on a large trade in the manufacture and supply of these daguerreotype plates, together with the "mats," cases, and hinges for the latter. They also manufacture brass, German silver, and silver-plated hinges for cabinet furniture, pianofortes, &c. These are mostly very plain, or, when ornamented, are simply so in outline; and they are well-finished and tasteful-looking articles of their class.

Cabinet hinges.

The daguerreotype plates are prepared by the rolling process, the silver being plated upon the copper in the course of the operation, and this is afterwards cut into the various sizes required. The "mats," or ornamental mountings, usually fitted into the cases for keeping in the picture, are engraved and chased for the most part by machinery, and by an ingenious adaptation of eccentric movements, the "sight" of the metal frame is corrected to the true circle, oval, or oblong with turned corners, in the same operation by which the chasing is performed.

So successful has this branch of the metal toy trade of Connecticut become, that it is confidently asserted that the German manufacturers, who formerly supplied these articles, are nearly driven out of the markets of the United States.

Candlesticks and candle lamps.

Candlesticks and candle-lamps also form a portion of the trade of Waterburg, and the Scovil Company are successfully engaged therein; but, from the fact that oil is extensively used for domestic illumination, and the lamps most generally used are of a peculiar and somewhat primitive character, the manufacture of candlesticks or candle-lamps is not likely to become of much importance.

Whilst upon this point, it may be well to remark, that the lamps alluded to, and which supply the place of the common candle in domestic use, are articles of great consumption, and are manufactured in immense quantities, chiefly of tin and pewter, and even of common glass and earthenware. They are of various sizes, and are adapted to one or more wicks, according to the purpose for which they are required. These are almost universally used, except when wax tapers or gas are adopted. Attempts are sometimes made to render them more or less decorative, especially the larger kind, with two or wicks for table use; those manufactured of glass, either cut or pressed, being the most successful in this respect. From the peculiar construction required, however, there can be little doubt that a pleasingly ornamental article might be produced by the combination of metal tubes and glass,—the former being used as a column, and the latter material manufactured as the oil-holder and base, or the column and base might be manufactured entirely of metal, and the oil-holder alone of glass. At present the article is unnecessarily clumsy and inelegant. It is, however, in its integrity, and has not yet been overlaid or disguised by false or crude ornamentation, in which use has been bidden defiance to for the sake of decorative effect.

Wire drawing.

Waterbury Brass Company.

Brass pans.

Wire-drawing is an important branch of industry in many parts of Connecticut, chiefly for the manufacture of pins. The Burnham and Benedict Manufacturing Company, Waterbury, and the Waterbury Brass Company, are both largely engaged in wire-drawing and metal rolling; but the chief manufacture of the latter company is that of brass kettles, or pans, of a novel and excellent character and make. Instead of casting them, as is frequently done in England, the article is "spun" up from a flat plate, by powerful machinery, constructed for the purpose. Nor is this process confined to the smaller sizes, since they range from 1 to 20 or 30 gallons and upwards. There is great equality of strength throughout, with a less weight of metal than usual. The brass, from the rolling and spinning processes, is more consolidated and tougher than when cast, and therefore is not so easily fractured; yet the whole is effected without the process of annealing. The vessel is strengthened with an iron wire worked into the rim in the process of manufacture. A most useful, and even elegant-looking, though plain utensil is thus produced at a moderate price, and is especially well suited by its lightness, capacity, and durability, to the purpose of the emigrant to the Western States or to new countries, for which markets it is chiefly manufactured.

Pins, hooks-and-eyes.

American Pin Company, Waterbury, Connecticut.

The manufacture of pins and hooks-and-eyes by machinery is an important feature in the trade of Waterbury, as also of other places in the State of Connecticut. The American Pin Company, whose works are at the above named place, manufacture these articles largely, turning out 1,200 packs of solid-headed pins per day, each pack containing 255 dozens of pins. The machinery for manufacturing hooks-and-eyes is very complete, and is somewhat similar to that employed for the same purpose at Birmingham. A machine employed in the American Pin Company's Works for "papering" the pins is most ingenious, and accomplishes the object with great certainty and rapidity. By a regulation of the company, strangers are not allowed to see the pin-making machines.

The American Pin Company contribute specimens of their manufacture, both in pins and hooks-and-eyes, to the Exhibition at New York.

Stamped brass.

Rolled brass.

In stamped brass some progress has been made in several parts of the States. The Waterbury Hook-and-Eye Company, besides manufacturing the articles thus indicated by their title, have just commenced the manufacture of stamped brass articles, such as window cornices, curtain bands, &c.; for the establishment of which trade German operatives have been engaged, but the results could not be fairly judged of, as these workmen had only recently commenced operations. In this branch of the metal trades, however, the Burnham and Benedict Company contribute some admirable specimens to the New York Exhibition, as also excellent examples of rolled brass in large plates.

Automaton machine for making ladies' hair-pins.

The manufacture of ladies' hair-pins by automatic machinery has just been commenced by Messrs. Blake and Johnson, manufacturers of case-hardened steel rollers and machines for the use of working jewellers, Waterbury. This machine is of their own invention and construction, and is remarkably effective. A quantity of wire is coiled upon a drum or cylinder, and turns round upon its axis as suspended from the ceiling of the workshop. The point of the wire being inserted into the machine, and the power applied, the wire is cut off to the requisite length, carried forward, and bent to the proper angle, and then pointed with the necessary blunt points, and finally drooped into a receiver, quite finished all but lacquering or japanning. The pins are thus made at the rate of 180 per minute, and the machine goes on without any immediate superintendence being required until the whole coil of wire is exhausted.

Ornamental brass-work.

The manufacture of ornamental brasswork, as applied to the purposes of lighting, forms a progressive and important branch of industry in several large cities, but more especially in Philadelphia. In the establishments of Messrs. Cornelius, Baker, and Company, and Messrs. Archer and Warner, of that city, as also in that of Messers. H. N. Hooper and Company of Boston, Massachusetts, the rapid progress made of late years in the manufacture of ornamental gas-fittings and table lamps, &c., is fully exemplified.

Brass castings for chandeliers and gas-brackets.

The chief portion of the work is cast, little or no ornamental stamping being attempted. It is scarcely possible, however, to conceive better work than the generality of these ornamental brass castings. At Philadelphia especially, the greatest attention has been paid to this point, and a peculiar advantage is derived here from the fact that the sand obtained in the vicinity of that place is of so fine a character as to require no sifting for use, and the finest castings are easily made, so far at least as material goes. The pattern is simply modelled in wax, and from this a brass pattern is cast direct, no white metal being used. The brass pattern is carefully and thoroughly chased, and from this all future work is produced. Thus, the shrinkage and variation of size between the white metal pattern and the brass casting, often found to exist in castings made from the former, is avoided, and the register of the two sides of a branch, or other portion of a chandelier or gas bracket requiring to be fitted together, is more perfect than it otherwise would be. The brass pattern, too, takes a sharper and more decisive chasing than white metal, and, as the castings are never chased, as from the fineness of the sand they are sufficiently sharp and effective without it, the accuracy of the pattern is of the first importance, and all that is required to be done after the castings leave the foundry is to file off the very small amount of superfluous metal retained in the casting, and fit the parts together.

Spinning from flat metal plates.

The bodies of chandeliers, whether vases or dishes, are invariably spun up from the flat metal plate, instead of being stamped, as is usually the case in England. This is the old method of producing these portions of lamps and similar articles, and appears to have been introduced into practice in America by German workmen. It is not confined to small bodies; but is used for the production of large sizes than are usually considered practicable. Very large bodies, however, are generally hammered up.

Circular shears for cutting sheet metal.

Discs of plate metal, for the purpose of spinning up, are cut by a machine with two wheels, having the sharp edges working against each other, after the manner of a pair of shears. Those circular cutters work with great ease and rapidity, giving great facilities to the workman, and presenting an elegant method of doing laborious work with the greatest possible ease and certainty.

Annealing spun-work.

In annealing the spun work, after the first process of raising from the flat plate, it was formerly found that the metal cracked, more particularly in the bottom angle. As the first form from the plane is a simple truncated cone, the second process of spinning, after annealing, gives the requisite curves to the sides. To prevent this cracking during the annealing process, it has been found that the simple bending or squeezing in of the sides of the cone, until the circle becomes a somewhat elongated ellipse, and then placing a quantity within each other, has the desired effect, and cracking rarely if ever takes place. This is stated on the authority of Mr. Cornelius,* of the firm of Messrs. Cornelius, Baker, and Company, by whom it has been successfully adopted in practice.

Messrs. Cornelius, Baker, and Company, Philadelphia.

In this establishment, consisting, as it does, of three distinct factories, one for casting and soldering, another for machine-work, and a third for filing and fitting, 700 workmen are employed. Commenced about 30 years ago, it has gone on increasing its sphere of action to the present time, a constant attention to the scientific principles of metallurgy and mechanism having tended to its prosperity from the beginning; when, in the establishment of a business, at that period so novel in its character, and so doubtful as an enterprise, it was more than probable that everything, except traditionary modes of action, would be rather repudiated than encouraged. In point of economy, however, science has been found to be the cheapest as well as the best assistant, as indeed it ever will be when combined with a thorough knowledge of the work to be done by its aid.

Value of science as applied to manufactures.

Brass dipping.

In the dipping process, as pursued in these works, great modifications are made in the character and strength of the acids used. It was found that from the variation of temperature at Philadelphia, ranging, as it does, from below zero in the winter to 96° and 98° in the shade in the summer, nitric acid became unmanageable during the hot season, as its fumes were given off so rapidly as to injure the health of the workmen. The accurate scientific knowledge, however, brought to bear upon this point,—one, too, involving the very existence of the trade, except at a frightful destruction to human health and life,—has obviated every difficulty, adapted the acids to the temperature, and the dipping department is comparatively free from noxious fumes, even under the highest of the above temperatures. On the day, June 20th, on which I visited the works, the thermometer stood at 98° in the shade.

The result is equally satisfactory as regards the colour of the work when dipped, some novel effects being produced, and a singular purity of colour obtained.

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* If any additional proof was required as to the value of accurate scientific knowledge as applied to a manufacture in which mechanical invention and great skill in chemistry and metallurgy is so essential to complete success, it will be found in the fact that the gentleman above-named received an education specially adapted to the requirements of the business which his father, the late Mr. Cornelius, was about to establish in Philadelphia; and that his studies in abstract science and the various discoveries and expedients, both mechanical and chemical, as resulting therefrom, have given the house, of which he is now the head, an immense advantage over both foreign and domestic competitors. The system, order, and accuracy which prevails throughout this establishment is full evidence of the influence of a mind reaching as far beyond the ordinary traditions of the workshop and foundry, in a scientific sense, as in the practical result it goes beyond the mere dilettantism of speculative science *sans* application. G. W.

Lacquering.

In lacquering, considerable improvements have also been made. It was found that the lacquers made after the English formula lost colour very quickly, from the extremes of temperature already noted, and that during the months of July and August, when the due point of the barometer is reached in Philadelphia, the red lacquered work always streaked in the direction of the marks of the spinning tool on the broad surface of metal. After a series of experiments, carried through several months, Mr. Cornelius succeeded in making a lacquer, which he states to be quite permanent under any variation of temperature.

The usual methods of decorating burnished surfaces by varnish pencillings and dippings, for coloured effects, are adopted here, as in Europe. The lacquering is all done by men, no females being employed.

Table lamp columns.

The columns of table lamps are made of sheet metal formed into tubing, and fluted upon a mandril, by means of a wheel acting in the direction of the axis. This is said to have been adopted by Messrs. Cornelius, Baker, and Company before it was attempted in England, and they were enabled by these means to go into the market with a great advantage in price over the cast column lamps imported from Europe, as the cost of that portion of each article was two-thirds less in Philadelphia than in Birmingham.

Lard lamps.

The manufacture of lamps for the consumption of lard still forms a considerable item of trade, especially for the Western markets; but these are not so much in demand as formerly, owing to the more extensive use of gas. At least 150 patents have been taken out, from time to time, in the United States for contrivances for effecting the consumption of lard for the purposes of lighting. The lard lamp manufactured by this firm, however, appears to have been one of the most successful; the principle of the candle being kept in view, and the heat applied in the direction of the point of illumination.

Gas fittings.

Great attention is paid both by Messrs. Cornelius, Baker, and Company, as also Messrs. Archer and Warner, to the perfect accuracy of all their gas-fittings. The gas-works of the city of Philadelphia are celebrated for the perfection to which the manufacture of gas is carried, and the thorough scientific principles upon which every detail of the establishment is carried out, not the least important of which is the uniform gauge of all fittings; so that any part becoming defective is at once repaired without trouble, and, of course, at a less expense than when a constant variation in the gauge of the fittings is permitted.

Gas-burners.

At Messrs. Cornelius, Baker, and Company's manufactory, the sawing of the slit of the gas-burner is executed with the greatest accuracy, and, although not done with such rapidity as by the process usually adopted in England, the greatest exactitude is obtained as to the quantity of gas the burner is capacitated to consume; and whenever a new saw is substituted for an old one, the slit is carefully tested as to its capacity for consumption, by means of a gas-meter placed by the side of the workman. In short, guessing is avoided in everything connected with this establishment.

Fitting of gas pipes.

In the fitting of the pipes the same accuracy and care is manifested. The screw is turned in a lathe to prevent the possibility of splitting the pipe, which is more or less invariably done by the ordinary screw-plate; but the crack being very minute, is not discovered until after having been some time in use, when the gas begins to escape, and continues until a permanent leakage is established.

Composition for gas-pipe joints.

In order to secure the joints completely, a composition of wax, resin, and venetian red is applied to the tap, which is sufficiently hot to melt it; the pipe is then screwed in, and the joint is at once sounder and cleaner than when cemented by the application of white lead, the usual material employed for this purpose in England.

Amongst the workmen employed by Messrs. Cornelius, Baker, and Company, are eight or nine Englishmen,* the rest being Germans, French, and Americans; but the majority are undoubtedly native workmen.

Messrs. Archer and Warner, Philadelphia.

Messrs. Archer and Warner employ about 225 workmen, and are engaged in precisely the same trade as Messrs. Cornelius, Baker, and Company. The remarks as to the character of the work produced by the last-named firm, especially gas-fittings, and the perfect division of labour, which is not so general a feature in American as in European manufactories, applies with equal force to both establishments, and though that of Messrs. Archer and Warner is not so extensive, its operations are carried on in a systematic and efficient manner, the results being shown in the articles produced, which are excellent of their class. The designs are adapted to the markets to be supplied, and as these are generally of a third or fourth rate character, according to the English standard, a redundance of ornament, rather than purity of style, is the chief point aimed at.

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* One of the modellers and designers employed in this manufactory at the date of my visit, was a student of the Birmingham School of Design at the period I quitted my duties there, *pro tem.*, to proceed to the United States in the business of this Commission.
Another modeller from Birmingham had been so employed for some years. G. W.

Chandeliers, &c.

In no instance can the chandeliers, gaseliers, or lamps manufactured in the United States be said to come into competition with the better class of productions as manufactured in Birmingham. The demand for the larger kinds being chiefly for use in hotels, public saloons, &c., a showy and attractive article, at a comparatively cheap rate, is that most in demand; and though some of the details of those produced for these purposes are admirably modelled, there is often a great lack of that congruity in the parts by which a perfect *ensemble* can alone be realised.

The smaller articles, for domestic use, are often more effective and far more tasteful than the more ambitious examples, less ornamentation being aimed at; for, as lightness in weight of metal, and cheapness in cost, are the chief points, redundancy in decoration is not possible. At the same time as a certain amount of effect is essential, and this is attained by a repetition of the same details in varied forms of application; the chains used in the cheaper kinds of chandelier are formed of links, which, though very ornamental and effective, are scarcely touched by the file, being sufficiently accurate, when put together, to answer the purpose of effect and give the appearance of a large amount of work where very little really exists.

Girandoles.

A peculiar kind of girandole, chiefly purchased by the artizan class as a chimney ornament, is largely manufactured. The base and vertical support is of brass with glass prisms, and often with two branches for candles. The choice of subject for the vertical portion is often ludicrously inappropriate, yet the sale of these things is said to be immense, from their showy character and low price.

Comparing the prices of the low-priced articles, it may be calculated that an English chandalier which would cost $18 (say £4 5*s.* sterling), is very fairly imitated, or more correctly speaking, its place in the market is supplied by the American manufacturer at $11½ (about £2 15*s.* sterling).

Brass work for ships.

Messrs. H. N. Hooper and Co., Boston, Massachusetts.

The manufacture of decorative brass work for ships, steam-vessels, &c., is largely carried on by Messrs. H. N. Hooper and Company, Boston, Massachusetts, in addition to the manufacture of chandeliers. The cast work is generally in good taste, and there is more artistic breadth of effect in the ornamental portion of the articles manufactured by Messrs. Hooper, than in those produced at Philadelphia; the latter being florid and showy, whilst the former are more massive and simple.

Spun work is even more largely used than in the manufactories at Philadelphia, and the skill and dexterity of the workmen in this department is very great.

Stamped parabolic reflectors.

Parabolic reflectors, for ships' lamps, are manufactured by Messrs. Hooper by a stamping process. These reflectors are generally of a much larger size than usually attempted by this process; but it is effected with complete success, both as regards accuracy of form and lowness of price, as compared with hammered work.

Bells.

Bells of an excellent character are also cast in this foundry. It may be remarked, however, that the most extensive bell foundry in the United States is that of Messrs. Meneley, Troy, State of New York.

Ornamental brass work in the Exhibition at New York.

The contributions in ornamental brass and bronze work to the Exhibition at New York are generally good, the most extensive display being made by Messrs. Cornelius, Baker, and Company, Philadelphia, and the remarks already made as to the character of their productions, apply to their contributions to the Exhibition, as those fully bear out the opinions expressed as to the general excellence of the work, and its adaptation to the markets it is intended to supply.*

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* A prize medal was awarded to this firm by the jury (Class XXII) of the Great Exhibition of 1851, for chandeliers.

Ornamental bronzes.

In ornamental bronzes, the specimens of native manufacture are so mingled with those of European production, as to prevent a proper estimate of the position of this branch of industry. There are, however, two or three establishments in New York, the proprietors of which employ French and German workmen in the production of many articles of mere ornament or exceptional use, but which can scarcely be considered as coming under the denomination of works of art in metal.

Lamps.

In lamps there are numerous contrivances for the consumption of oil, lard, camphine, &c. These are all more or less of a decorative character, but do not call for special notice after the remarks already made as to the manufacture of these articles.

Brass joints for gas and steam tubing

The specimens of brass joints for gas and steam tubing, manufactured by Mr. Samuel Griffiths, New York, and contributed to the Exhibition, are sufficient proof of the admirable manner in which those useful articles are manufactured.

Locks.

In locks the contributions are pretty extensive; but want of time and the difficulty in obtaining access to the goods, from the lack of authorised attendants, and the unarranged state of some portions of this department, prevented that close examination into details which was requisite in order to form an accurate opinion. The general finish of the articles, however, appeared to be good.

Iron safes.

Iron safes for banks, counting-houses, &c., are manufactured to a large extent by many hardware houses. These are as varied in construction as the many contrivances of a similar kind for the safe custody of cash and books are in England, and are the subjects of as many patents as the authorities at Washington can be induced to grant.* The workmanship of nearly all the safes exhibited at New York is of a very excellent character, and the style and finish generally tasteful and appropriate.

Hollow ware.

In hollow ware, Messrs. Cresson and Company, of Philadelphia, to whose foundry other more pressing calls prevented a visit, exhibit various culinary and household articles of a good and useful character, the produce of their manufactory.

Tin-ware.

The specimens of tin-ware show a good character of work, and, as already stated, this branch of the hardware trade is largely carried on in various parts of the State of Connecticut, whence most of the examples exhibited at New York come. A useful and well-made series of machines and tools for the use of tin-plate works, manufactured by Messrs. Roys and Wilcox, Mattabesset Works, East Berlin, Connecticut, and exhibited by them, show several novel contrivances for economising labour in the manufacture of this ware.

Gimlet screws.

Gimlet screws, in which the point of the screw supersedes the use of a gimlet in making the requisite hole, are largely manufactured by the New England Screw Company, and now extensively used in the United States; and the variety of sizes exhibited at New York show the applicability of this simple, but useful contrivance to be more extended than is generally supposed.

Carriage springs.

Carriage springs would appear to form an important item of manufacture, and the examples shown at the Exhibition, at New York, are of good make and finish.

Miscellaneous hardware.

Miscellaneous hardware, chiefly of Connecticut manufacture, articles of wire-work, bed-springs, and sundry contrivances more or less useful and ingenious, show the extent to which the manufacture of all kinds of articles in every-day use is now carried on in the United States; and that whilst the fitness, strength, and proper construction is carefully attended to, there is no lack of executive skill in substantial objects of utility.

Manufactures in Britannia metal will be reported upon with those departments of industry coming under the head "Works in Gold and Silver, and their imitations," as these usually form a branch of those establishments in which gold, silver, and electro-plated wares are carried on.

Cast-iron fittings of the library of the Congress, Washington.

As the application of cast iron to architectural purposes has been already alluded to, more especially in its application to external construction and decoration, it may be desirable to notice here that in the Library of the Congress of the United States, now in the course of construction in the Capitol, at Washington, the whole of the interior fittings are of iron. The piers supporting the book-shelves, and the balustrade of the gallery, which is carried all round the room, are of this material, cast in ornamental forms, with medallions, also in iron, of Washington, Franklin, and other eminent American statesmen. These latter are in high relief, and are most admirably modelled and cast. The book-shelves are also plates of iron; and whilst the whole is thus rendered fireproof, it is also highly ornamental.

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* By the patent laws of the United States, the Commissioner of Patents decides whether or not any contrivance or invention is a fit subject for an exclusive right.

CLASS XXIII.

WORKS IN PRECIOUS METALS, AND THEIR IMITATIONS—JEWELLERY, AND OTHER PERSONAL ORNAMENTS.

Works in gold and silver.

A love of display, which is certainly one of the characteristics of the people of the United States, affords ample encouragement to those branches of industry in which gold, silver, and precious stones are employed; and, as a matter of course, the imitations of works of this class are equally in demand amongst those whose means will not permit of an indulgence in the more genuine articles. At present this tendency towards the more luxurious forms in which the decorative arts are employed is undirected, so far as the great mass of the people is concerned, by any principles of taste, and is, therefore, completely at the mercy of the unreasoning judgment of the manufacturer, whether domestic or foreign, who caters to what he supposes to be the prevailing taste of his customers. The American manufacturer, however, is in some respects wiser than his foreign competitor, and in many instances leaves the ultra-ornate to be supplied from Birmingham and Sheffield, and directs his energies to the development of a better and less exuberant style, which he finds is demanded by the more refined amongst his countrymen. Thus works are occasionally produced which would not discredit any European house. Still the manufacturer has to consider the demands of the market, and, as far as possible, regulate the character of his staple productions thereto; and, as this market gets its tone in a large measure from the abominations which the European manufacturer chooses to believe are best suited to the wants and wishes of his Transatlantic customers, the American producer has to follow the lead thus given. The shopkeeper, however, is perhaps more to be blamed than any other person. He assumes that his customers want an enormous display of unmeaning decoration, and therefore orders little else from the manufacturers. The public have, consequently, little choice; and constantly seeing ugliness and exuberance in ornamentation, its taste and judgment becomes vitiated and depraved, and the simplicity and fitness of pure forms appear tame rather than beautiful. A chaste style of decoration, therefore, appears to be plainness itself amidst the glittering nonsense usually presented for inspection. Thus the incessant effort to meet supposititious demands on the part of the public results in creating the very want of taste and judgment complained of in the abstract, but practically catered to and encouraged. The more enlightened of the manufacturers of the United States, however, are strongly impressed with the conviction, that they and their customers of the shopkeeping class are the real instructors or vitiators of the taste of the people; and though at present borne down by the style and character of the goods most in demand, as arising from the causes above named, yet with an educated people they believe that this cannot last for any great length of time. It would be well, therefore, for those foreign manufacturers who supply these articles to the American markets to consider how far a purer taste will affect the demand for their productions, as the time may quickly come when the doctrine "that anything will do, so that there is enough of it," will no longer be true of the kind of goods it is now their province to supply so largely.

Public taste.

The growth of a purer taste in the United States.

It has been thought desirable to make these remarks preliminary to reporting upon the present state of the class of industry under consideration, as there exists, in England at least, very erroneous views as to the present and growing tastes of the people of the United States. For whatever the past might have been, or the present may be, the future is likely to be very different. The daily increasing intercourse with Europe is pregnant with great changes. Persons of even moderate means now make a point of visiting, not only England, but those continental States in which the arts have flourished for ages, to search out and carry back with them new ideas of art, and of correct principles as applied thereto, which their education and the eminently practical turn of their minds will not allow to slumber on their return home. Looking with contempt upon those articles of luxury which formerly pleased a merely puerile taste, these individuals influence their countrymen more largely than may be thought possible, since the educated intelligence of the latter renders them equally alive to the value of sound principles; and a few excellent examples in the way of illustration have an influence, and convey an amount of instruction, which the uneducated could never feel or understand. English manufacturers have it especially in their power to either assist in the formation of a purer taste in the American people, or, by neglecting their growing judgment, to oppose and retard, but not crush it. By assisting its development they are likely to secure to themselves, or, at least, share very largely in a market for a long time almost entirely their own, but which is gradually being occupied by their Transatlantic competitors. By neglecting the progress of a more enlightened and purer taste, they will as inevitably lose it altogether.

Manufacture of gold and silver plate.

The manufacture of gold and silver plate is more or less carried on in nearly all the larger cities, especially New York, Boston, and Philadelphia. In the last named it partakes of the character of a settled trade, there being some twelve or fourteen establishments in which a considerable number of persons are employed, and the productions of which are of a varied, but for the most part of a useful as well as an ornamental character. Table services, and all the articles of utility comprised in suites of plate for domestic use, form the staple articles; and these are manufactured in large quantities.

Characteristics of workmanship.

The workmanship is usually sound, but it often happens that on close examination a deficiency in that nicety of finish, especially in the chasing, which characterises the best English work, is observable. Still it is rarely found that the equally, or perhaps more objectionable practice of over chasing, to the destruction of the artistic effect of the details, is committed. The fault is evidently that of timidity of handling; but there is a wisdom in leaving off at the right time, which the elaborate chasings of English works rarely display.

Effects of primary education.

In most of the manufactories a few European workmen are to be found; but the Americans engaged in this department of industry are usually of a superior class, and it is remarkable how soon they get into the system of those amongst whom they are thrown as mere learners. In this as in other branches of industry, their minds being thoroughly prepared by education, they seem to seize upon and master even very difficult points in manipulation and construction, as it were by mere instinct. It is, however, more than probable that this rapidity of conception is unfavourable to that perfect and complete execution which is often characteristic of the more plodding and painstaking workman; and on the whole there is, as already stated, less finish than is to be found in kindred works as produced in England. This opinion applies to the general run of productions in the class under consideration, whether in gold and silver, or the less costly, but often equally meritorious productions in German silver, electro-plated wares, and Britannia metal. At Philadelphia Messrs. Bailey and Company produce excellent articles in silver, many of which are in good taste. The gold filagree and pearl work manufactured in this establishment is, when the French taste is not followed, both superior in design and workmanship. There is, however, in these trinkets, as in other things, too great a tendency to follow the mere conceits of the European works of the same kind, such as close imitations of natural forms, &c., rather than rely upon the good sense which suggests constructions adapted to the nature of the material used. When this is done it is almost invariably with success.

Messrs. Bailey and Company, Philadelphia.

Filagree and pearl work.

Messrs. Conrad, Bard, and Son, Philadelphia.

Messrs. Conrad, Bard, and Son, also of Philadelphia, manufacture gold and silver plate, but a considerable trade is carried on by them in the manufacture of spoons and forks. For this purpose they use a machine invented and manufactured upon their own premises, by which the production

Machine for the manufacture of spoons and forks.

of these articles is very much facilitated.* Two circular dies or rollers are sunk with forms of the articles to be rolled out. These are usually spoons of two sizes, a fork, and the side of a knife-handle. As the intaglio of one die is accurately adjusted to, and agrees with that of the other, one forming the *obverse* and the other the *reverse* of the pattern, both sides of the article are perfected at once, and the rollers accomplish the work of a stamp press in a much more effective and economical manner. The rollers are about 5 inches in diameter, and are of course manufactured of the best steel and case hardened. Being set to the thickness of the articles required, and that of the sheet metal from which they are to be made, the perfect passage of the pieces through the rollers is secured by a series of notches sunk in the margin of each figure upon the die, the impression of these being in the superfluous metal surrounding the work when delivered from the machine. This has to be cut off, and is effected by a circular saw, the prongs of the forks being cut in a similar manner. It is an ingenious and useful invention as applied to light articles in silver, taking up a small amount of space in a workshop and doing a much larger amount of work than a stamp press.

The Ames Manufacturing Company, Chicopee, Massachusetts.

Electro-plated wares.

The Ames Manufacturing Company, Chicopee, Massachusetts, are largely engaged in the manufacture of silver and electro-plated wares, and the castings in that branch of their establishment were of a very excellent character. Attention is chiefly confined here to articles most constantly in demand, castor-frames, dish-covers, breakfast and tea services, and the most decided requisites of table suites, being the staple. There was much taste and great excellence of workmanship in some of the examples. In others, the usual mistakes in following European patterns were visible.

Bronze statues.

Brass cannon.

This extensive manufactory is curious from the great variety of articles and the multiplicity of operations carried on. Brass cannon are cast with great success, and a colossal statue of De Witt Clinton, as also a work of some excellence, the Angel of the Resurrection, both by Mr. H. K. Brown, the sculptor, the latter being a contribution to the Exhibition at New York, have been lately produced, and in a manner highly creditable to the skill of all parties concerned. This is a novel branch of the metallic arts in the United States, and one requiring no small amount of technical knowledge to get through with success.

The artistic castings in iron produced here are equal to anything by the best houses in Europe, and is abundantly proved by the medallions in alto-relievo of Washington, Franklin, and other eminent men, executed for the library of the Congress in the Capitol at Washington, as a portion of the decorations of the interior fittings, which, as stated before, are entirely of iron.

Swords.

Swords also form an important branch of manufacture by the Ames Company, the blades, hilts, and scabbards being all produced upon the premises. There is also a manufactory of turbine wheels, cotton machinery, planing machines and lathes.

A few English workmen are employed and one or two Germans as modellers; the rest of the workmen are all Americans.

Messrs. R. Gleason and Company, Dorchester, Massachusetts.

At Dorchester, Massachusetts, Messrs. R. Gleason and Company manufacture plated wares of fair average quality, employing about 100 workmen. These are white metal with electro-plated surface. Some of the castors made here are very tasteful and original, and the forms of some of the tea and breakfast sets are also good. The dish-covers are mostly after English models. The general style of the article, as also the workmanship, especially as regards strength and durability, is highly to be commended considering the influence of the ordinary demands of the market for the light, cheap, and showy; but there is certainly a lack of perfect finish in the details.

Britannia metal wares.

The Britannia wares of this house are also good.

Lamps in brass form a department of Messrs. Gleason's trade. Die-work is chiefly used here, with some spun work in those portions of the articles to which it is most applicable,

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* A similar machine to this is said to be in operation at Paris. The principle is the same as that invented by Krupp, the exclusive right to use which, in England, has been secured by Messrs. Elkington, Mason, and Company, of Birmingham, and now so successfully worked by them for the manufacture of spoons and forks. The machine of Messrs. Conrad, Bard, and Son, is suitable only to very thin work; and for the want of a self-acting guide, as applied to Krupp's machine, the work is liable to come out in a curve instead of a right line, and the amount of scrap metal and dust arising from the margin surrounding the article, as delivered from the machine, must be a serious drawback to its profitable use as compared with the more perfect machine in use at Birmingham. G. W.

Messrs. Reid and Barton, Taunton, Massachusetts.

Messrs. Reid and Barton, Taunton, Massachussetts, produce Britannia metal goods on a considerable scale, it being the chief branch of their trade. The electro-plated articles of this house, however, are of excellent character.

In Britannia metal originality of design is aimed at, and with some degree of success; but they copy any successful patterns from Europe, more especially those produced at Sheffield.

They employ about about 100 persons, but only one Englishman. The remarks already made as to the lack of accuracy in finish applies to Messrs. Reid and Barton's productions, yet the effect of the work is generally good, and their contributions to the New York Exhibition are at once highly creditable and pleasing specimens of a useful class of articles.

Works in gold and silver in the Exhibition at New York.

The contributions in this class displayed in the Exhibition at New York are varied in character, but presenting certain points of excellence, and the ordinary over-ornamented articles are the exception.

Messrs. Bell, Black, and Company, of New York, as also Messrs. Tiffany, Young, and Ellis, of the same city, besides being extensive importers of European plate, are also manufacturers, and their contributions are of a good character. A tea service of California gold, with a *plateau* of silver, is remarkable for the elegance of the smaller pieces and the general excellence of the workmanship, and amongst the variety of articles exhibited by this house are some of elegant and tasteful form and ornamentation. The engraved work, too, is good, and of better design than usual. Two ewers exhibited by Messrs. Tiffany are also of good form and excellent in decoration, and a dinner service also contributed by them is neat and elegant, being the very reverse of the usual mode.

Messrs. Jones, Ball, and Company, Boston, Massachusetts, exhibit a very satisfactory series of the ordinary articles in silver for domestic use.

Forks and spoons of good make are contributed by Messrs. Rogers, Brothers, Hartford, Connecticut.

The exhibits in Britannia metal goods are of a useful character; the "turned" ware, manufactured at Troy, New York, by Mr. John H. Whitlock, being chiefly noticeable for their simplicity and utility; those of Messrs. Hattersly and Dickenson, of Newark, New Jersey, being more ornate, but of good forms.

Jewellery.

The contributions in jewellery do not call for any special remarks; but the manufacture of gilt toys, and imitations of gold and silver ornaments for personal decoration, forms a very considerable item in the industrial productions of some parts of New England.

Waterbury Jewellery Company, Waterbury, Connecticut.

At Waterbury, Connecticut, the Waterbury Jewellery Company manufacture the ordinary gilt articles set with coloured glass and artificial stones. The designs are more like the Paris productions of the same class than those of Birmingham, but both French and English articles are imitated, and the work is of average quality. Machinery is extensively used in this manufacture, and with success as regards the result as seen in the quality of the work.

Attleborough, Massachusetts.

Attleborough, Massachusetts, is the chief seat of the gilt toy and jewellery trade of the United States, but an intended visit was obliged to be abandoned for want of time.

In 1850 there were nineteen establishments for the manufacture of jewellery, employing 381 operatives, the value of the articles produced annually being $478,200, or about £100,000 sterling. In this place the first manufactory of gilt buttons, as also the first manufactory of gold and gilt jewellery and silver ware, were established in the United States.

The manufacture of bronzes, &c., so far as at present carried on, has been alluded to in Class XXII.

CLASS XXIV.

GLASS MANUFACTURES.

Glass.

The glass manufactures of the United States are fairly established, and there can be no doubt of the present healthy position and future progress of this branch of industry. With superior materials in abundance, and skilled labour increasing with the development of the trade in which it is employed, the progress from the earlier productions, in which articles of common use were the staple, to those rich and decorative works which belong to luxury rather than to utility, has been steady and continuous; and though from the position of the people the more useful articles are those to which the manufacturer directs most attention, yet there is a laudable spirit abroad which compels him to attend to those branches of his trade wherein his European rival and instructor excels in the artistic elements of production.

Pressed glass.

It must be remembered, too, that the method of manufacturing glass by means of metal moulds, in imitation of cutting, now generally known as "pressed glass," is an American invention, and was first introduced into England in 1834, by Messrs. Richardson of Stourbridge.

Chief seats of the glass manufacture.

Pittsburg, Pennsylvannia; Boston, Massachusetts; and Jersey city, New Jersey; are respectively seats of the glass trade, although there are many manufactories spread over different portions of the Federal Union, especially in the New England States.

Pittsburg is chiefly the seat of the glass trade for the supply of the South and West, and its productions are confined exclusively to the more useful articles for domestic use, of which there are eight establishments, employing 500 operatives, and the manufacture of window glass, of which there are eleven establishments, employing about 600 hands, and seven furnaces for the manufacture of phials. Cylinder glass, of a common character, is the chief make in window glass; and with materials in abundance either close at hand, or within the range of the water carriage on the Ohio, Alleghany, or Monongahela rivers, which unite at Pittsburg as a centre, every facility exists for the prosecution of the glass manufacture to an enormous extent. Coal, too, is cheap and in great abundance.

Window glass.

Fort Pitt Glass-Works, Pittsburg, Pennsylvania.

The Fort Pitt Glass Works are now carried on by Messrs. Curling, Robertson, and Company. The managing partner is a native of Birmingham, but has been at Pittsburg many years. His father was a working glass-maker, who emigrated in 1812 as a gardener, to evade the laws then in force against the emigration of skilled mechanics, &c. About 100 workmen are employed here, and there are three furnaces of five pots each. The make is mostly in pressed glass, and all the more useful articles are manufactured; these being of good form and clear colour. The peculiar wants of the consumer are consulted, and the goods are sent to all parts of the United States. The chief markets are those of the South and West.

All the materials are prepared on the premises. Missouri sand is used for the finer articles, and Alleghany sandstone, when found free from iron, is used for the commoner purposes after being pounded and burnt. These materials are obtained in great abundance in Pittsburg.

Messrs. Bakewell, Pears, and Co., Pittsburg, Pennsylvania.

Messrs. Bakewell, Pears, and Company carry on a similar trade, and produce an excellent assortment of useful goods which are entirely of pressed work. The average price of tumbler glasses is 2*s*. per dozen. Pressed glass decanters are manufactured by both the above named firms very successfully. These are considered as novelties in American manufacture. They are generally first made as tumblers, and then worked up in the neck, &c., afterwards. The result is a cheap presentable article, very much in demand.

Pressed glass decanters.

A new design for a "pressed" decanter just completed by Messrs. Curling, Robertson, and Company, appeared, from its form, to have been made by the "plunger" going in at the bottom, thus making the body and neck at the first operation, the bottom being closed afterwards.

The metal moulds for the manufacture of pressed glass are made upon the premises of each manufacturer; and as the production of a novelty is a point aimed at by each, as an important element of success, the getting up of new designs demands a considerable amount of care and attention.

Boston and Sandwich Glass Company, Sandwich, Massachusetts.

The Boston and Sandwich Glass Company, Sandwich, Massachusetts, have an extensive establishment in which a good style of work is carefully carried out. There are four furnaces of ten pots each; the make of glass is about 60 tons per week, and 500 persons are employed. The general run of useful articles in cut and pressed glass are made by this firm. The forms are generally tasteful and well adapted to the material and mode of manufacture, especially in pressed glass, of which very large examples are produced. Costly cut articles, however, are not manufactured.

The Boston and Sandwich Glass Company make large quantities of the lamps peculiar to the country, already described in Class XXII. as being used instead of candlesticks. The exceedingly low price at which these articles are sold creates a great demand for them, as the glass offers facilities for cleaning which no other material presents, the oil being so easily wiped off the surface; whilst a decorative effect is produced at a cheap rate by the adaptation of the forms to the pressed methods of manufacture.

New England Glass Company, East Cambridge, Boston, Massachusetts.

Probably the most complete establishment in the United States for the manufacture of all kinds of glassware is that of the New England Glass Company, East Cambridge, Boston, Massachusetts.

This is an extensive concern, conducted with admirable system, the productions comprising every kind of flint and ornamental cut and coloured glass, many of the specimens of the latter approaching the Bohemian standard in quality of colour and gilding. A lightness of form, too, has been obtained in some articles which indicate considerable skill and accuracy in manufacture and finish.

About 550 operatives are employed. There are two 12-pot and three 10-pot furnaces, of from 1,500 to 1,800 lbs. of metal each.

Sand and lead.

The silex used is a sand of beautiful quality, the produce of Berkshire county, Massachusetts. The company manufacture their own minium, the material in pig lead being brought from the State of Missouri, in which lead has been of late years worked to a considerable extent.

The glass when manufactured is very clear and pure in colour, the pressed work being remarkably smooth, even, and free from *stria*. The designs and forms are generally well adapted to the material and mode of production. Amongst the large examples, a centre-piece of a tazza form, with the patera or dish from 2 feet to 2 feet 6 inches in diameter, and the stem and base in proportion, afforded abundant evidence of the extent to which this branch of the business has been carried, and the facility with which large articles are now produced by the pressed method.

Cut glass.

The cut glass showed care and skill; the bottles are generally of excellent form and make, clean in the neck, and not over-ornamented with cutting. A satisfactory result, too, is obtained in some articles by the combination of cutting and pressing. The smaller details are pressed, and the larger and broader parts cut.

Opal glass.

The opal glass manufactured at this establishment is better than the great portion of that produced in Europe. It is clear in body and pure in colour. Bone is used instead of arsenic for the finer qualities. For common articles the latter material is employed as usual.

Gilding on glass.

Gilding is executed very successfully, and it is stated that other houses in the United States have attempted to gild their own work and have failed, this being the only establishment in which it is now carried on.

Imitations of Bohemian glass. Venetian paper weights.

The imitations of Bohemian glass are good, and some of the designs are of a superior character, whilst others are of the usual inadaptive types, and are over-ornamented. The Venetian paper weights manufactured here are very excellent examples of their class.

Silvered glass.

Articles in glass, silvered and engraved by Kidd's process, are extensively manufactured, and are in great demand in the United States from its effective and showy appearance.

Chemical glass.

The New England Glass Company have paid a large share of attention to the production of a good quality of glass for chemical and philosophical purposes; and this now forms another important branch of business.

Glass exhibited at New York.

The contributions of this firm to the Exhibition at New York sustain its well-earned reputation. A complete service, pressed, in a neat diamond pattern, and another of cut glass, are very elegant in character, and beautiful in workmanship.

The other contributions in glass do not call for special remark.

Time did not permit of an inspection of the several glass works established in Jersey city, and Brooklyn, Long Island, both opposite to New York city, some of which have a reputation for producing good articles of their respective kinds.

CLASS XXV.

PORCELAIN, AND OTHER CERAMIC MANUFACTURES.

Porcelain.

The manufacture of porcelain is quite in its infancy in the States, but there can be little doubt that its progress will be, at no distant period, both rapid and effective, as materials in abundance are to be found in many portions of the vast territory of the Union. When the value and properties of these materials are more thoroughly understood than at present, by those most interested, it would be contrary to the genius of the people of the United States if efforts are not made to realize every advantage which their working can give.

Queen's Ware Pottery Works, Pittsburg, Pennsylvania.

At the Queen's Ware Pottery Works, Birmingham, Pittsburg, Pennsylvania, a ware similar to that known in England as "queen's ware" is manufactured. The forms of some of the articles are good, and the syrup jugs, mounted with Britannia metal, an article much used in the Western States, are very fair specimens of their kind. All the attempts at decoration were in relief only, and though a blue (cobalt) glaze is used, still the colour of the clay makes the result anything but satisfactory. The oxyde of cobalt, by which this blue glaze is produced, is manufactured in large quantities by Messrs. Coffin, Hay, and Company, Philadelphia, who export it to Europe. The ore is found in great quantities near both the Missouri and Mississippi rivers. The fine clay of the State of Missouri is obtainable in great abundance, and that, with the porcelain clays of the State of Delaware, is said to have been already exported in small quantities, at least, to England.

Oxyde of cobalt.

Missouri and Delaware porcelain clay.

An experimental specimen of the former clay, tried with a blue glaze, was very pure in colour and clear in the fracture.

The proprietor of the Queen's Ware Pottery Works is an Englishman named Bennett, and it is a subject of some regret to report that he was the only person throughout the whole of this inquiry who refused to myself the information asked for. Personal and merely private questions were always carefully avoided, as calculated to prove embarrassing to those who, in a spirit of candour and liberality, were willing to furnish all needful information on public grounds only. Mr. Bennett, however, declined to give any information as to the progress and present position of the trade in which he has been successfully engaged for some years past. It is a source of infinite satisfaction that a course at once so puerile and so obnoxious to common sense, was taken by a foreigner rather than by a native of the United States, and that an intelligent American gentleman, deeply interested in the porcelain trade, did all in his power to compensate for the absurd course pursued by Mr. Bennett, who, in endeavouring to keep secret the resources and power of a country to whose hospitality and encouragement he owes his present position, simply excited a greater amount of curiosity and inquiry.

Earthenware made at Liverpool, near Pittsburg.

The manufacture of the common kind of earthenware is established and carried on at Liverpool, at some distance from Pittsburg, on the Ohio river. Here there are several manufactories, but want of time did not permit of a visit. The chief markets for the produce of these potteries are found in the Southern and Western States, and from the information in which subsequent inquiries resulted, it would appear that Pittsburg and Liverpool are likely to become the great seats of the porcelain and earthenware manufacture, from the fact that fuel is cheap, materials of various kinds abundant, whilst the demand must be constantly on the increase as the Western States become more populated. It is scarcely possible, therefore, to imagine a wider field for enterprise and skilled labour than is here presented, or one in which there would be a greater certainty of ultimate success.

Fenton's patent flint enamelled ware.

Messrs. O. A. Gager and Company, Bennington, in the State of Vermont, manufacture a ware known as "Fenton's patent flint enamelled ware." This is produced from a very white clay found near Charleston, South Carolina, and the beds of which this firm has secured the right of working for twenty-one years. It takes a beautiful glaze, and presents a remarkably clear and transparent appearance. It is chiefly used in the manufacture of the mottled-brown ware, but presents a white fracture, as the mottled surface is simply in the glaze. Of this kind of ware, even at the present rate of production, $1,500 worth per week is manufactured, for which a ready market is found. This ware is got up in imitation of a much commoner article usually manufactured of yellow clay. The present trade, however, appears to be merely a beginning, and a large development, both in the kind and quality of production, may be easily foreseen; as the facilities are great, and an enormous demand awaits a corresponding supply.

Earthenware bleach rings.

The useful article of bleaching-rings is manufactured of this porcelain clay, and finished with the brown glaze. These are largely used by bleachers, dyers, and calico printers, for running pieces of cloth through from one part of the dye or bleach-house to another in the various processes. They are preferable to the glass rings usually employed, as they are less expensive, and are not so liable to break under the expansion and contraction of the iron stays in which they are fixed for use. The demand for this article alone is greater than the manufactory can at present supply.

Parian ware.

A parian ware, of good colour and surface, is also manufactured by this firm, from materials obtained near the manufactory, in the State of Vermont. It is composed of the flint, quartz, felspar, and clay obtained from the Green Mountain district and the adjacent rivers. This ware is unglazed, and will not stand the test of hot water. It presents, however, a valuable and useful material for a large class of ceramic productions not as yet manufactured in the United States, especially the more ornamental articles for which parian is so largely used in England.

Porcelain exhibited at New York.

In the Exhibition at New York is a very full exposition of the various kinds of articles and wares manufactured by this house.

Messrs. Haughwout and Dailey, New York city.

In the higher branches of the porcelain trade, the productions of Messrs. Haughwout and Dailey, New York, take a fair position, though the articles contributed by them to the New York Exhibition are by no means equal to the best examples shown in their own establishment. Without being manufacturers of porcelain, they employ about 100 persons, male and female, in the decorations of the various articles they import in the *bisque* state. Many of the workmen are Englishmen, the females being chiefly employed in the gilding and burnishing.

Porcelain flower-vases, &c.

The articles consist of the usual stock pieces, such as flower-vases, dessert and toilet services, decorated with landscapes, figures, fruits, flowers, &c., and profusely gilded. These are equal, sometimes superior, to the average productions of the same class made and decorated in Europe. Exuberantly ornate, they are supposed to be adapted to the market, according to the prevailing idea of the requirements of the purchaser, as already alluded to in the consideration of the influence of a suppositious public taste in design in works in gold and silver. The worst feature, however, is, that here, as in Europe, if the purchaser's taste is above the average of that which the manufacturer or shopkeeper fixes as his standard, the intended customer must come down to the latter, or give up his intention to purchase, since the less ornamental, but really more tasteful article, is not to be had. The shopkeeper, believing that a redundancy of decoration is the thing most in demand, and which he thinks best, has not provided for those whose taste may be in advance of his own, and, worse still, discourages any attempt in the manufacturer or the workman to produce something better, because, in his opinion, it will not *sell*.

Sign letters and door furniture in porcelain.

There are some useful porcelain articles, such as sign letters and door furniture, amongst the few exhibits of this class contributed to the Exhibition at New York, in which there is both elegance of design and skill in execution, both of painting and gilding.

Earthenware knobs for common locks.

One branch of the ceramic manufacture, as connected with door furniture, is peculiar to the United States, and this is, the very extensive use of earthenware knobs for the fittings of common locks. These are usually made of a striated mixture of yellow and red clay, and finished with a strong brown glaze. Arrangements are made in the moulding for the insertion of the spindle, and they are exceedingly useful and serviceable articles. In testing the strength of one of these knobs, it required a very heavy blow to fracture it. They are extensively made at Pittsburg and Liverpool, Pennsylvania, as large quantities are consumed in the former place by the miscellaneous hardware houses, in fitting locks and latches.

CLASS XXVI.

DECORATIVE FURNITURE, UPHOLSTERY, &C.

Furniture.

The manufacture of furniture is carried on to a great extent in nearly all the large cities and towns of the United States. In the former, extensive establishments exist for the production of decorative furniture, the constructive portions being for the most part prepared by machinery,* by which labour is greatly economised, as well as perfect accuracy of fit in the same article of furniture.

Furniture in the New York Exhibition,

No department of industry is more largely represented in the New York Exhibition than that of furniture. This may arise from the fact that there is a large number of manufactories in New York itself, thus affording facilities for the better display of this class of productions.

At Cincinnati, Philadelphia, and Boston, there are also a number of very extensive establishments. In the former city, German workmen are largely employed, and the carvers, generally, are either Frenchmen or Germans, with a few Englishmen.

Carving in wood.

Elaborate carving is the rule rather than the exception, and this is fully borne out by the examples shown in the Exhibition, the best of which are evidently the work of Europeans, and the designs partake more of French and German than of English characteristics.

The American woods are not so much used as might be expected, walnut and oak being those which are generally selected.

Owing to the imperfect state of the arrangements, one contribution of furniture, said to be of very novel construction, could not be examined. In the space of an ordinary sideboard, it was stated that a bedstead and complete chamber suite was contained. As it was locked up, and no key to be found, its merits were unascertained, nor could any one connected with the Exhibition state who it belonged to, or where it came from.

The ordinary class of useful and cheap furniture, so largely manufactured for the Western States, was not represented in the Exhibition. This is to be regretted, as much ingenuity and economy of material is often shown in the production of this class of goods.

Papier mâché.

In papier mâché, the productions are all below mediocrity, being chiefly imitations of the worst style of pearl inlaying and japan work executed in England. Everything approaching to purity of design, or in the inlaid work, to geometric arrangement of the parts, is as carefully avoided as it generally is in Europe.

Wall papers.

Paper hangings are manufactured to a large extent, and are printed both by block and by cylinder. They are chiefly, however, of the cheaper kind and of the usual character as regards design. The better class of papers approach the English and French papers in the character, though not in the elaboration of the workmanship. Messrs. Perkins and Smith, New Bedford, Massachusetts, contribute some good specimens in dining, drawing, and bed room papers. They are all blockwork, and are as clear and as artistic as the style of design would permit.

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* See Mr. Whitworth's Report.

Curtain papers.

A peculiar article in paper-hangings is largely manufactured for the Western States. This is about 35 inches wide, and is known as "curtain paper." An ornament, within a panel, is printed, extending to the length of about 1½ yard, and those are cut off and used as substitutes for roller blinds, by a large class of people in the West.

Painted wall decorations.

Painted wall decorations are evidently growing in public favour, and the extent to which this style of ornamentation is carried in some of the hotels and saloons of the larger cities is calculated, if directed by a purer taste, to do much for art in its higher forms. Unfortunately the upholsterer, rather than the artist, is the director, and the arabesque or pictoral panel is consequently a very secondary matter as compared with the hangings, the carving and gilding, and the carpet. In New York, several of the public buildings are very fairly decorated, mostly by French or Italian artists. The Metropolitan Hall, an admirable room, used for public meetings, concerts, and lectures, is effectively decorated, in the Italian style, with panels, arabesques, and a coffered ceiling, the general tone of the whole being pleasing and satisfactory. The lighting of the room by gas is admirably and tastefully arranged by running a series of gas-burners along the cornice of the gallery, these corresponding with the decorative members. The result is an equal diffusion of light all round the sides of the room, the centre being illuminated by a chandelier.

Decorations of the Metropolitan Hall New York.

Carving and gilding.

Carving and gilding, as applied to mirrors, pictures, and window cornices, is another important item of industry in this class, and in point of excellence of workmanship, is on a par with the usual English productions. The style of ornament, however, is at once exuberant and heavy.

Public taste in furniture.

On the whole, the decorative arts as applied to furniture are vitiated for any present influence on public taste, by an overwhelming tendency to display; fostered to a large extent by a class of persons whose object it is to crowd as large an amount of work into as small an amount of space as possible, and who prefer charging for labour rather than skill and taste. This reacts on the public mind, and habituates it to redundancy and over-ornamentation rather than to purity and simplicity resulting in the really beautiful.

COPYRIGHT OF DESIGNS.

Copyright of designs.

The law for the protection of copyright in designs forms part of the patent laws of the United States, and the office for granting copyrights, or rather patents, forms a department of the Patent Office at Washington, with a special officer to attend to applications of this class. The protection is granted for configuration and arrangement of the ornaments. None but citizens of the United States are entitled to the privileges, which are granted after due examination as to originality, &c., for seven years; or half the time granted in a patent for invention, &c. The fee paid is one-half the patent fee, or $15 (say £4 sterling) instead of $30, but no portion of this is returned if the patent or copyright is not granted, or the patent is withdrawn, as is the case with regard to full patents, two-thirds of the fee being returned in the case of either the rejection or withdrawal of a claim for a patent.

Forms for obtaining a copyright of a design.

The forms are precisely the same as for obtaining a patent for an invention, &c. A petition, specification, and an affidavit or declaration on oath as to originality, must be filed, and a specimen or such essential portions of the pattern as may be needful to show the peculiarities of design, together with duplicate drawings, must be deposited at the Patent Office.

With regard to the kind of articles, the designs of which are usually patented, stoves and metal castings are by far the greatest number. In textile fabrics, very few are protected. Indeed, with the exception of the first-named articles, it is difficult to suppose that much originality in design could be legally claimed. In 1852 there were 126 applications for patents for designs, and of these 106 were granted and 20 were rejected.

In the majority of cases, copyright of design can only be valuable to the manufacturer so far as it enables him to secure to himself, by a rapid process, the exclusive immediate use of his invention. This is especially the case in textile fabrics; and the system of examination, with the delay in the decision, as practised in the United States, would be fatal to the value of one-half the designs registered in England.

ART EDUCATION.

Art-education as applied to manufactures.

The question of art-education, as applied to manufactures, is beginning to claim serious attention in the United States, and though at present taking a totally different direction to that in which it has been the chief object of the more practical minds in England to direct it for the education of the artizan and the creation of a class of art-workmen, it is not the less significant that American manufactures have reached that point at which it has become desirable that originality of thought should be infused into them by means of the designer, if not by the agency of well-instructed workmen. The latter, however, follows the former, as inevitably as effect follows cause; for the design once obtained, the very effort to realise it educates the workman in a greater or less degree in the process.

School of design for females, Philadelphia.

So far as institutions for the special purpose of teaching art in its application to industry have been at present carried, they are intended, with the exception of that attached to the Maryland Institution, Baltimore, for the instruction of females only. The first was established about four years ago at Philadelphia, chiefly through the efforts of Mrs. Peter, the lady of the late British Consul to the State of Pennsylvania. Having visited several of the schools of design in England, and kindred institutions on the continent of Europe, Mrs. Peter conceived that many well-educated females, the vicissitudes of whose families often compelled them to seek employment as a means of obtaining a livelihood, might, if properly instructed, render themselves useful in many departments of design as applied to manufactures, especially in the various kinds of textile fabrics, both printed, woven, and embroidered, as also in paper-hangings and hand-made lace. The result of her efforts was the establishment of a School of Design, partly supported by the contributions of herself and friends, and partly by the fees of the students, which were wisely graduated according to their means and the object for which they studied. Considerable difficulty, however, was experienced in carrying it forward for want of funds to fairly establish it at the outset, and as a permanent support, although it never appears to have lacked pupils; and after a period the committee of the Franklin Institute were induced to undertake the management of the school at Mrs. Peter's request, as she removed after the death of her husband, the late William Peter, Esq., to her native city, Cincinnati, Ohio. The accidental death of Mrs. Anne Hill, the principal of the school, whose talents and earnest devotion to her duties had given a position to the school which promised well for the future, again produced a change, and now the school is divided into two parts; those students who following one of the male teachers constitute a somewhat private establishment, and those who remain attached to the more public institution as originally founded. Each, however, is seeking assistance from the funds of the State of Pennsylvania, or to obtain a charter of incorporation and subscriptions to the formation of an endowment fund, as it has been found that current subscriptions and fees would not support the Institution. In consequence of the division above alluded to, and the embarrassed state of its funds, the connection of the original school with the Franklin Institute was dissolved, a committee of gentlemen taking the property and assuming the debts. It is now proposed to raise an endowment fund of $50,000 dollars (about £11,000 sterling), and thus provide means for carrying on the school by charter, as the fund properly invested would realize a satisfactory permanent income. Towards this object upwards of $17,000 had been subscribed in June last.

Rate of students' fees to the Philadelphia School of Design.

The business of the school is carried on in a large well-arranged house, situated at the side of one of the beautiful squares for which Philadelphia is so famous, which, laid out as walks and now filled with well-grown trees, afford in themselves lessons in art to the thoughtful student of design. This school formerly numbered seventy-four students, but there were only twenty-three on the books at the period of my visit in June. The classes, however, are usually indifferently filled during the summer months, and it is a rule for nearly all the scholastic institutions of the United States to take their long vacation during the hot months of the year. The rival establishment, conducted by a former male teacher, is known as the "Institute for the instruction of Young Ladies in Design," as contra-distinguished from the "Philadelphia School of Design for Women," and numbered 32 students. The fees to the latter school are $2 (not quite 10*s.* sterling) per quarter for those whose situation in life will not allow them to pay more, and $4 for those who can afford to pay that sum. The students who cannot afford the higher fee are certified by subscribers, in fact are nominees at *half-fee.* Ladies, whose means are ample, pay $10, $15, $20, or $24, that is from £2 5*s.* to £5 5*s.* per quarter, according to what they learn; and these graduated scales appear well adapted to an institution in which the student may enter any class, provided the fees of that class are paid, without reference, judging from the works, as to the amount of preliminary training in the elements of art. This, however, may be considered as the natural result of so large a dependence upon the fees of the students, as the teachers are rather in the position of private teachers of drawing, than the officers of a public institution; and therefore the choice of the student has more influence on the character of the instruction than sound principles, which, carried out quite independent of the likings or dislikings of the recipient of the instruction, must ever be the great value of a well-endowed public school, conducted on an exact plan of progressive education.

Drawing class, Franklin Institute, Philadelphia.

In connection with the Franklin Institute,* Philadelphia, is a drawing class for mechanical and architectural drawing, in which from 60 to 70 students receive instruction during the winter, on three evenings per week for 24 weeks, commencing on the first Tuesday in October in each year. The fee is $5 (about £1 3*s.* sterling) per quarter, or say £2 5*s.* for the session. No free hand-drawing is taught.

The Franklin Institute first commenced, in 1824, those annual exhibitions of manufactures which have since become so popular throughout the United States, and which have exercised so beneficial an influence in promoting and encouraging the early efforts of American manufacturers by premiums, and the public recognition of the benefits conferred upon the community at large by isolated industrial efforts.

School of Design, New York.

The success of the School of Design for Women, at Philadelphia, under the late principal, Mrs. Hill, and the management of Mrs. Peter, appears to have suggested the foundation of similar institutions at New York and Boston. The New York School has only been established within the year, and the vacation prevented any inspection of its classes. The promised information as to sources of revenue, rate of fees, number of students, &c., has not been furnished; but it would appear that, from its recent formation upon the same plans as those of Philadelphia and Boston, the facts connected with its working would be of less importance than those of the last-named city, which, though more recently founded, seems to be upon a more permanent footing than that of Philadelphia.

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* The character of this Institute stands deservedly high, as under the title of the "Franklin Institute of the State of Pennsylvania for the Promotion of the Mechanic Arts," it has promoted secondary education in an efficient manner, by instruction in chemistry and mechanics, lectures, a permanent museum of models, minerals, and geological specimens, an admirable library, to which no light literature is admitted, even as a gift, and a reading room. Formerly, three courses of lectures were delivered every session by three permanently appointed professors, in chemistry, mechanics, and technicology; but now there are two courses of ten lectures each during twenty weeks, a different subject being taken each night of the week: thus, during the early part of the session 1852–53 the subjects were arranged as follows: Mondays, on Botany; Tuesdays, on Astronomy; Wednesdays, on Mining Geology; Thursdays, on the influence of heat, air, and water on Natural Phenomena; Fridays, on Chemistry, as applied to the arts. Thus, a continuous course of oral and experimental instruction is kept up throughout the session, the pupils of the drawing class under twenty-one years of age being admitted free to the lectures.

The Institute also publishes a monthly journal, devoted to the promotion of the mechanic arts. This is the oldest periodical in the United States devoted to this subject, and was commenced in 1826, two years after the first annual exhibition of manufactures Each number contains 72 pages octavo, at a yearly subscription price of $5. G. W.

The New England School of Design for Women.

"The New England School of Design for Women" was opened in October, 1851, under the superintendence of an Englishman, a former student of the Birmingham School of Design.* The rooms were adapted to the accommodation of 70 students, and this appears to have been the average number in attendance during the greater part of the time the school has been established. The objects of the school, as stated in the prospectus, are:— "1. To educate a body of professed designers, capable of finishing original designs for manufactures, and other purposes where ornamental designs are required.—2. To teach the various processes of engraving, lithography, and other methods of transferring and multiplying designs.—3. To educate a class of teachers in drawing and design."

Rate of students' fees to the Boston School of Design.

As the school is intended for a standard or normal school, students are not admitted under fifteen years of age. The fees are $5 (about £1 3*s.* sterling) per quarter. The class hours are from 9 a.m. to 2 p.m. every week day except Saturday, and "the school is open during all working hours for students in special departments, and for the industrial classes."

Programme of instruction.

The programme of instruction, without being very precise, is based upon the general terms of those of the English schools. All students are to go through an elementary course, after which they are to study their own speciality. On this elementary course hangs the whole question of absolute success, or that partial success only which carries on an institution like this for a time, but lays no solid foundation for future progress in itself or in its students. By the annual report for the year ending 30th September, 1852, it appears that the manufacturers of New England are alive to the importance of educating even a class of female designers (the question of art-workmen being as yet untouched); have supported the school with their subscriptions; and, better still, have given employment to those whose progress had been such as to enable them to be useful in designing or drafting for manufactures, as in the case of the two female students employed by the Lowell Manufacturing Company, quoted in Class XIX. Several pupils had learnt to draw on stone, and others to engrave and draw on wood. Several of the examples in the school were very creditable in manipulation, but entirely devoid of that sound artistic basis, always to be discovered, when existing, in the slightest work; and the want of which can never be concealed in the most elaborate production.

Instruction in botany.

Lectures are delivered on botany, and a female teacher is specially engaged in giving instruction in this science to all the pupils.

Privileges of subscribers.

The fees paid by the students have been already stated above, but a subscription of $20 per annum gives the subscriber the privilege of nominating one student *free.* Ladies subscribing $3 per annum in support of the institution are enabled to vote at the annual meeting in the election of the committee, &c., but have no privilege beyond that. The expenses have hitherto exceeded the annual income, being $3,500, the proceeds amounting only to $2,700,—$1,500 in subscription and $1,200 in students' fees. The House of Representatives of the State of Massachusetts has therefore recently sanctioned a grant of $1,500 (about £350 sterling) per annum, for three years, in support of the school, as an experiment, thus giving it the advantage of State sanction, and raising its income to the amount which its present wants demand.

State grant in aid of the Boston School of Design.

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* Mr. W. J. Whittaker, an intelligent schoolmaster, who, feeling the importance of drawing as a part of ordinary education, devoted a portion of his time to the acquirement of a knowledge of outline drawing. His artistic education, however, does not appear to have been carried beyond a fair power to copy "Dyce's Outlines." Prior to leaving England he had, in connection with Mr. Hermann Krüsi, of the Home and Colonial Normal Schools, published a small work on "Inventive Drawing on the principles of Pestalozzi," the method indicated in which he had pursued in the school of which he was the teacher in Birmingham, and which he also followed in the United States when teaching drawing. He was no longer master of the above Institution at the date of my visit, but had commenced a private school of art in Boston, which gave evidence of care and attention to the wants of his pupils. This is now abandoned, and he is devoting his attention to the establishment of similar schools in other towns in the State of Massachusetts. Thus the New England School is the only school of the kind in Boston.
G. W.

Character of the instruction.

The general character of the instruction given, both in the school at Philadelphia and Boston, has relation more to pattern-making for manufactures, and teaching drawing as an amusement or accomplishment, than inculcating and enforcing the steady pursuit of the arts of design in their highest forms, whether as applied to manufactures or otherwise. Still, enough has been done to show that, with teachers more efficiently trained to the precise purpose for which the schools are founded, with such examples around as would tend to elevate the minds of the students to the purer forms of classic, and the severer science of mediæval and oriental art, alike in form, colour, and proportion, a progress of a very extraordinary character would be the result. The rapid progress made by the students of these schools is another evidence of the influence of the primary education which it is the good fortune of the children, male and female, of the United States to receive. As in the manufactories the youths enter with minds prepared by sound instruction to grapple with the technical difficulties of their future trades, so in these schools young girls commence their study of art with an amount of useful knowledge eminently calculated to open their minds to the influence of the instruction imparted.

Influence of primary education.

Defects of the School of Design.

The radical defect of the schools, however, is that which could be easily remedied—the want of a really useful and practical series of ornamental casts, and a severe course of elementary outline examples. The constant use of the former would train the eye both of teacher and pupil to the appreciation of a higher and better style of art than the comparatively mean casts of the ordinary builders' and decorators' ornaments hung about the class rooms; whilst study in a more precise elementary course would give the requisite power to appreciate fully the great principles of design, which a correct analysis of the examples could not fail to give. Pattern-making would become in reality pattern-designing, and artistic principles and practice prevail, where manipulation without power, and efforts without meaning, are now the only result.

School of Design, Maryland Institute, Baltimore.

The School of Design, forming part of the "Maryland Institute, for the promotion of the Mechanic Arts," at Baltimore, approaches much nearer in its character to the standard and objects of such schools in Europe, and is under the management of an Englishman, Mr. Minifie.*

The school was opened in 1851, and then consisted of three departments—the Primary, in which elementary free-hand drawing, &c., was taught; the Architectural, in which the principles in construction and the styles of various periods were studied; and an Engineering Class, in which the drawing of machinery, mathematics, and the general principles and rules of calculation, as applied to mechanical engineering, formed the subjects of instruction. This plan appears to have been changed since Mr. Minifie undertook the direction, and the school now forms one department divided into six classes:—1st. An Elementary Class; 2nd. A Geometrical Class; 3rd. A Mechanical Class; 4th. An Architectural Class; 5th. An Engineering Class; and 6th. An Artistic Class; the titles of which will sufficiently indicate the studies pursued in each.

Classification.

On the plan of the classes being first made public, about 1,000 persons registered their names to attend; of these 800 applied for seats at the opening of the school; ultimately 400 students attended, and were divided into the six classes, each meeting one evening per week, from 50 to 70 students being the attendance in each class, instructed by a teacher and assistant teacher, and occasionally by the professor, whose attendance is not continuous. A staff of fourteen teachers was engaged in the work of the school last session. No charge is made to members and junior members of the Institute, but a small fee is about to be imposed.

The period of the year prevented the inspection of the classes in operation, as they are only carried on during the winter, as in the Franklin Institute at Philadelphia. The results of the instruction during the session of 1852-3, the second of the operations of the school, and the first under the arrangement last indicated, as shown in the drawings of the students displayed in the Institute, were very creditable.

The school, thus incorporated with the Maryland Institute, appears calculated to be of great service to the artizan class of the city of Baltimore, and if the system of instruction, as laid down, be carefully and steadily carried out, results of no ordinary character may be fairly predicted, more especially if better examples and models in ornamental art be obtained for the purposes of study, as the standard of art in this department is almost universally very low in the United States, because it is based upon modern adaptations of antique details, often so utterly transformed in their use as to be scarcely recognizable.

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* Mr. Minifie is the author of "A Text-Book of Geometrical Drawing for the use of Mechanics and Schools," a work of repute both in the United States, where it was first published, and in England.

Drawing class, Girard College, Philadelphia.

Model drawing.

The study of drawing in the public schools of the various States is exceptional, and no settled system exists. In the Girard College at Philadelphia, drawing is taught from models of geometrical solids; but the early progress of the students is retarded by the fact, that not being first taught to draw lines and simple forms projected upon a plane surface, and to be copied as an exercise for the hand and the eye in the apprehension of real form, they work in great uncertainty, and only attain proficiency, even in the delineation of lines, after a lengthened period. This is the experience resulting from all attempts to begin with models only; the power to draw the lines by which the forms of those models are to be represented, being still wanting.

Drawing class, High School, Philadelphia.

The drawing class of the High School of the city of Philadelphia is conducted upon the system laid down by a former professor, Mr. Rembrandt Peale, whose excellent little work on "Graphics" is the text-book of the class.* Unfortunately, the operations of the class were suspended prior to the general examination of the pupils, therefore it could not be seen at work. Formerly the more elementary studies were pursued in the Primary and Grammar Schools of Pennsylvania, as well as the High Schools; but the instruction is now almost entirely confined to the latter,—most probably from a want of teachers sufficiently well trained in drawing to act as instructors.

Conclusion.

Having thus considered the respective departments of industry coming within the range of the various classes committed to my charge to examine and report upon, it may be desirable to call attention to several peculiarities requisite to be understood, as affecting the demand for certain productions, in order to judge fairly of the aims of those whose object it is to supply the wants of their countrymen in those particulars.

Standard of quality in manufactures.

In textile fabrics the consideration of that sterling quality in make, which always forms so important an element in the judgment of the European consumer, is comparatively unattended to by the Americans. If the article looks well, and is of such a quality as to stand ordinary wear and use for a period, varying, of course, with the views of the buyer, even a slight advance in the price for a better quality of equal appearance only, will scarcely be obtained by the dealer. The material being expected to last for a single season, is purchased of a quality to do that, and no more. The next season the customer supplies himself again.

In furnishing fabrics, such as damasks, carpets, &c., the same principle prevails. A change is desired at the end of two or three years; carpets and furnishing draperies are purchased of such a quality as to look well for that period, and then others of a different style are brought in to supply their places. And this habit of almost constant change is said to run through every class of society, and has, of course, a great influence upon the character of goods generally in demand, which, although by no means devoid of those intrinsic qualities which are the essentials of good manufacture, yet are made more for appearance, and less for actual wear and use, than similar goods are in England.

Decorative art.

The development in the department of ornamental manufactures, both in textile fabrics and in metals, as also in furniture and decoration generally, has been alluded to under their respective heads, as also under that of art-education. There is no appearance of any attempt to strike out a national style, although the many peculiar features of the country, the habits of the people, and undoubted originality in the mechanic arts, would lead to the inference that a gradual repudiation of European modes and forms will take place; and that in art, as applied to the utilities of life, true principles in the education of the people in this respect are alone needed to produce results of a very satisfactory character. At present the co-mingling of totally different styles of decoration in architecture, and the adoption of European designs for totally different purposes to those for which they were originally intended, are amongst the least of the errors committed in a vague seeking after novelty.

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* Three copies of this work, presented by the publishers, Messrs. E. C. and J. Biddle, Philadelphia, are transmitted with this Report.

Art education.

In reporting upon the state of Art-education, so far as it has been carried, the great object has been to call the attention of the Americans themselves to the defects of existing efforts, in a friendly but earnest spirit. The future success of the schools of design, as already established in the United States, is likely to be seriously retarded by the absence of good examples suited to the wants of the student, and calculated to carry the instruction in the right direction; inasmuch as the working out of a true system of art-education depends so largely on a proper attention to this point.

That the taste of the people is rapidly advancing with the increased facilities of communication with Europe, and the higher aims to which education is tending, must be evident to every observer. The works in gold and silver, the character of the higher class of furniture, and the silks imported from France and used in the houses of the more wealthy classes, the love of pictures and articles of *vertu*, all show that an almost Oriental love of splendour is rapidly taking the place of those simpler habits and tastes which characterised the severer tendencies of the earlier European inhabitants of the North American Continent and their immediate descendants. With building materials of an unequalled character, the granite and freestone of New England, the marbles of Pennsylvania, and the bricks of Baltimore, give facilities for architectural display, which is gradually developing itself, alike constructively and ornamentally.

Compulsory laws on Education.

The compulsory educational clauses adopted in the laws of most of the States, and especially those of New England, by which some three months of every year must be spent at school by the young factory operative under 14 or 15 years of age, secures every child from the cupidity of the parent, or the neglect of the manufacturer; since to profit by the child's labour during *three-fourths* of the year, he or she must be regularly in attendance in some public or private school conducted by some authorised teacher during the other fourth.*

This lays the foundation for that wide-spread intelligence which prevails amongst the factory operatives of the United States, and though at first sight the manufacturer may appear to be restricted in the free use of the labour offered to him, the system re-acts to the permanent advantage of both employer and employed.

The skill of hand which comes of experience is, notwithstanding present defects, rapidly following the perceptive power so keenly awakened by early intellectual training. Quickly learning from the skilful European artizans thrown amongst them by emigration, or imported as instructors, with minds, as already stated, prepared by sound practical education, the Americans have laid the foundation of a wide-spread system of manufacturing operations, the influence of which cannot be calculated upon, and are daily improving upon the lessons obtained from their older and more experienced compeers of Europe.

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* The following are the clauses in the laws of the commonwealth of Massachusetts as affecting the education of children employed in manufactories.

"No child under the age of fifteen years shall be employed in any manufacturing establishment, unless such child shall have attended some public or private day-school, where instruction is given by a teacher qualified according to law to teach orthography, reading, writing, English grammar, geography, arithmetic, and good behaviour, at least one term of eleven weeks of the twelve months next preceding the time of such employment, and for the same period during any and every twelve months in which such child shall be so employed."—St. 1836, ch. 245, §1; 1849, ch. 220, §1.

"The above prohibition does not apply to any child who shall have removed into this commonwealth from any other State or country, until such child shall have resided six months within this commonwealth."—1849, ch. 220, §1.

"The owner, agent, or superintendent of any manufacturing establishment, who shall employ any child in such establishment contrary to the above provision, shall forfeit a sum not exceeding fifty dollars for each offence, to be recovered by indictment, to the use of common schools in the town where such establishment may be situated."—St. 1836, ch. 245, §2; St. 1842, ch. 60, §2; 1849, ch. 220, §3.

"It is the special duty of the school committees in the several towns and cities of the commonwealth to prosecute the owners, agents, or superintendents of manufacturing establishments, for employing children under fifteen years of age, who have not received the instruction above described."—St. 1842, ch. 60, §1.

Commercial advantages of the United States.

Commercially, advantages of no ordinary kind are presented to the manufacturing States of the American Union. The immense development of its resources in the West, the demands of a population increasing daily by emigration from Europe, as also by the results of a healthy natural process of inter-emigration, which tends to spread over an enlarged surface the population of the Atlantic States; the facilities of communication by lakes, rivers, and railways; and the cultivation of European tastes, and consequently of European wants; all tend to the encouragement of those arts and manufactures which it is the interest of the citizens of the older States to cultivate, and in which they have so far succeeded that their markets may be said to be secured to them as much as manufacturers, as they have hitherto been, and will doubtless continue to be, as merchants. For whether the supply is derived from the home or foreign manufacturer, the demand cannot fail to be greater than the industry of both can supply. This once fairly recognised, those jealousies which have ever tended to retard the progress of nations in the peaceful arts, will be no longer suffered to interfere by taking the form of restrictions on commerce and the free intercourse of peoples.

The extent to which the people of the United States have as yet succeeded in manufactures may be attributed to indomitable energy and an educated intelligence, as also to the ready welcome accorded to the skilled workmen of Europe, rather than to any peculiar native advantages; since these latter have only developed themselves as manufacturing skill and industry have progressed. Only one obstacle of any importance stands in the way of constant advance towards greater perfection, and that is the conviction that perfection is already attained. This opinion, which prevails to a larger extent than it would be worth noting here, is unworthy of that intelligence which has overcome so many difficulties, and which can only be prevented from achieving all it aspires to, by a vain-glorious conviction that it has nothing more to do.

In concluding this report I cannot do so without expressing my obligations, as an individual member of the Commission, for the courtesy, attention, and ever-ready kindness with which all my inquiries were responded to by all classes of Americans with whom my duties brought me in contact in the United States.

I have, &c.
(Signed) GEORGE WALLIS.

Society of Arts and Government School of Art,
Birmingham, December 31*st*, 1853.

APPENDIX No. I.

TABLE of PRODUCE, &c., of the COTTON MILLS at Lowell, Massachusetts, January 1853.

Manufacturing Company.	Number of Mills.	Spindles.	Looms.	Females employed.	Males employed.	Yards made per week.	Cotton consumed per week in lbs.	Kind of goods made.
Appleton Company	3	17,920	700	400	120	150,000	60,000	No. 14 shirtings and sheetings.
Boott Cotton Mills	5	51,866	1,432	870	262 including male tenders.	300,000	90,000	Drillings No. 14. Sheetings, shirtings, jeans, and printing cloth. No. 30.
Hamilton Manufacturing Company ..	4 and Print Works	47,168	1,340	750	406	250,000	80,000	Prints, flannels, ticks, and sheetings, No. 14 to 30.
Lawrence Manufacturing Company ..	5	44,800	1,382	1,200	200	260,000	95,000	Printing cloths, sheetings and shirtings, No. 14 to 30.
Massachusetts Cotton Mills	6	45,720	1,571	1,250	300	475,000	150,000	Sheetings No. 13. Sheeting and drillings No. 14.
Merrimack Manufacturing Company ..	6 and Print Works	71,072	2,114	1,650	650	377,000	84,000	Prints and sheetings, No. 21 to 40.
Suffolk Manufacturing Company ..	3	17,528	590	400	100	120,000	50,000	Drillings, No. 14.
Tremont Mills	2	16,608	620	400	100	155,000	46,000	Sheetings and shirtings, No. 14.
Total, exclusively cotton	34	312,682	9,749	6,920	2,138	2,087,000	655,000	
Lowell Manufacturing Company ..	1	8,050 (Cotton only.)	205 (Cotton only.)	800 (In cotton, wool, and carpets.)	500 (In cotton, wool, and carpets.)	50,000 (Cotton only.)	90,000 (Osnaburgs.)	Osnaburgs.
	35	320,732	9,954	7,720	2,638	2,137,000	745,000	

APPENDIX No. II.

CLASS XI.—COTTON.

Mr. Le Weeks to Mr. Wallis.

Sir, *Hannahatchei, Stewart County, Georgia, July* 25, 1853.

A communication has been received at this Bureau from an intelligent planter in Georgia, accompanied by several bolls of cotton, asking information upon the following points relating to the harvesting, ginning, packing, and manufacture of cotton; viz.:—

"1st.—Does the well-matured cotton boll yield its staple, or fibre of different lengths, in one or the same boll or lock; or does the fibre of an individual seed exhibit an approximate uniformity in its length before separation by the gin?

"2nd.—What per-centage of loss would be considered a fair average in your establishment for a twelvemonth stock on the gross weight of cotton consumed, by reason of dust, grit, or sand?

"3rd.—What is the per-centage of loss, as above, caused by vegetable ubstances, as leaves, grass, trash, motes, &c.?

"4th.—What is the per-centage of loss arising from shortened or divided fibre, caused by ginning, and which flies off during the process of manufacturing? Also, how much, in your judgment, is the strength and durability of your fabrics diminished in consequence of such breakage or division?

"5th.—Has the general condition of staple (as to length and strength) deteriorated for the last twenty years?"

The object of the communication above referred to appears to have been intended to disabuse and correct a sentiment prevailing in some of the cotton-growing States among the planters, that it is really non-essential, in *point of value*, to the manufacturer, whether the staple is broken by ginning, or whether it is foul from grass or other extraneous matter, except so much as it may happen to be increased thereby in weight. The question has also arisen whether there may not be an improvement made in the cotton gin, should it prove that the fibres attached to each seed are of approximate or uniform lengths.

Any information which you may be able to impart relative to the points herein considered will be acceptable to this Bureau, and will be duly appreciated by the cotton-planters in the South.

You will understand these inquiries to apply only to short staple or upland cotton.

I have, &c.

(Signed.) HENRY LE WEEKS.

Mr. Le Weeks to Mr. Wallis.

Sir, *Hannahatchei, Stewart County, Georgia, July* 28, 1853.

I would respectfully submit the following question to your consideration, in relation to "Sea Island" or "Long Cotton," desiring your attention and answer thereto at an early date after the receipt thereof.

"Does this species of cotton present a large comparative difference in the length, strength, and firmness of its staple or fibre? And, if so,

"Does this difference make it practically necessary that a process of assorting should be made a pre-requisite to its more successful manufacture?"

The object in view is to forward the cotton in such condition as will best meet the wants and convenience of the manufacturers. It is highly probable that the necessary assorting could be accomplished during the process of gathering and ginning while in the planter's hands, with more facility than after in has been packed in bales.

Your answers are anticipated with much interest by

Yours, &c.

(Signed) HENRY LE. WEEKS.

Mr. Wallis to Mr. Le Weeks.

Society of Arts and Government School of Art,
Birmingham, October, 11, 1853.

Sir,

I have now the honour to acknowledge the receipt of your communications of the 25th and 28th July, transmitted through His Excellency John F. Crampton, British Minister at Washington, to whose care I address this reply.

The queries contained in both your communications appeared to me of so much importance, that I considered it would be more satisfactory to you to have the opinion of one or more gentlemen, whose practical knowledge of the cotton trade would be a guarantee for the accuracy of their answers. I, therefore, communicated with Thomas Bazley, Esquire, President of the Manchester Chamber of Commerce, and Henry Houldsworth, Esquire, also of Manchester, two of our most eminent cotton-spinners, both of whom are producers of the finest yarns spun in Europe; and at the suggestion of the first-named gentleman, I also sent copies of your queries to Robert Hyde Greg, Esq., of Norcliffe, near Manchester, an extensive consumer of short staple cottons. I have now the satisfaction to quote their replies to my communications, so far as they affect the questions you have put to me. Mr. Bazley says:—

"*Manchester, September* 22, 1853.

"In the same pod of Sea Island cotton, short as well as long fibres are found and associated. Evenness of length of fibre is most desirable, and the consumers will always pay a higher price for long and equal stapled cotton; than for short and irregular cotton.

"If possible, cotton ought to be grown with its fibres of uniform length; but when they are irregular, any process which does not injure the cotton and sorts them, would be an advantage which would be appreciated.

"*Bowed* Georgia cotton, like any other, is found to consist of fibres of various lengths, but the most valuable is the most regular.

(Signed) "THOS. BAZLEY."

Mr. Greg replies *seriatim* to your queries:—

"*September* 26, 1853.

"Query 1st.—I believe, though I seldom have opportunities of examining, that the *matured boll*, of all sorts, contains fibre of unequal length, that is, some of each is *short*, but not a large per-centage of the boll.

"2nd.—The loss of spinning on a twelvemonth's account will be perhaps,

1	oz. in the lb.	of	fine,
1¼	"	,	fair.
1½	"	"	good middling.
1¾	"	"	middling.
2	"	"	ordinary.
2 to 4	"	"	inferior.

The latter loss depends chiefly on dust and sand, nothing else weighing heavy. From all these some fibres and some oily waste again find their way into coarser fabrics, selling from the mill at ½*d*. per pound possibly. What I have given is the difference between the cotton weighed in, and yarn weighed out, and often includes some *damp*.

"3rd.—Motes and vegetable matter amount to little in the better qualities, and perhaps one-half in middlings.

"4th.—When staple is short, we put in 5, 10 or 20 turns per cent. more in spinning, and of course, in that operation produce that per-centage less yarn.

"5th.—*Deterioration.*—About twenty years since, the *boweds* or Eastern cotton began to grow worse, shorter staple and much injured or broken, and 'napped' in ginning, and for ten years we never bought a *bag*—that being the form it then came in—but confined ourselves wholly to Gulf cotton, Orleans, or Mobiles, which (some might be as short as the boweds or Uplands) gave plenty of choice, and, I know not why, was seldom injured by the gin. About five years since there seemed to be a change in the Eastern cotton, the staple improved,—little injury from the gin; and the *bag* was wholly abandoned, and I now buy Orleans and boweds (Uplands) indifferently. During many years the *name* of boweds excluded half the buyers, and ½*d.* per pound less price was established solely from the name. This is now wearing away. I have heard that planters, finding the disrepute of their article, imported Orleans seed, and took other steps to improve. The cotton come this year is shamefully dirty. *Straws and broken stalks and grass* are quite unmanageable, independently of the objection of loss of weight; and *we* have cotton lying in Liverpool, and there are tens of thousands of bales no spinner will buy at any price. Leaves fall out in spinning, motes are struck out, sand and mud form only 1, 2, 3 or 4 ounces of waste, and may be estimated; but straws and grass bits clog the machinery, stop the frames, spoil work, and the operatives leave the mill and will not work the cotton at all. This defect reduces the value to a consumer 25 per cent., but this cotton is bought and sold by speculators, and now a great accumulation exists in Liverpool which will ultimately pass into consumption at a low figure. During many years past we have noted but very little mischief from the *gin*, though it may doubtless break the staple a little. In the Upland cotton *formerly* the damage was extreme, reducing the value 2*d.* per pound at 10*d.*

(Signed) "ROBERT HYDE GREG."

Mr. Houldsworth, having mislaid the copy of your questions transmitted to him, says,—"My reply, referring as it does to all the points of importance that occur to me, will probably contain, in addition, much that was not specially asked for." The reply is as follows:—

"*October* 8, 1853.

"In the spinner's estimate of long staple cotton, it may generally be considered that *strength* is the first requisite. A fair and uniform length of staple next (say from 1⅛ to 1⅝ inch for medium purposes, and 2 inches long for the very finest), then *fineness*, and, lastly, *getting up*, *cleanness*, and *colour*.

"The spinners of the lower qualities attach most importance to *strength* of fibre and *cleanliness*, and the spinners of the finest qualities much importance to the *getting up*.

"Within certain limits a very considerable and prejudicial difference in the length, strength, and fineness of the staple of the same sample of Sea Island cotton prevails. This difference appears as if it arose in part from different degrees of maturity or development of the fibres. It exists in the greatest degree in the finer qualities of Egyptian cotton.

"It not unfrequently happens that cotton containing much fibre, worth 3*s.* per pound, is deteriorated 6*d.* to 9*d.* per pound by the mixture of short, coarse fibres in the same locks.

"The writer has some reason to think, from an examination of the few pods he has seen, that great difference of quality of fibre exists in the same pod, and in the fibres attached to the same seed,—a differenee that might possibly be lessened by giving the latest developed fibres a longer time to ripen, without any sensible damage to the earlier fibres.

"The difference in the quality of the fibres in the same lock of cotton is very different in different brands and in particular seasons.

"It is probable the inequality of fibre in respect to the three important particulars of *strength*, *length*, and *fineness*, arises from more causes than one, and is influenced by the selection of the seed, the cultivation and character of the soil, the point of maturity of the pods when gathered, and the seasons. Of these the last only is beyond the control of man.

"With regard to seed, the success of Mr. Kinsey Burden, of South Carolina in improving the length of staple of the finest class of Sea Island cotton, about the year 1825, by a selection of seeds, affords a presumption that the *strength* of fibre may be improved by similar means.

"In respect to soil and cultivation, it is presumed these must influence the fibre in some degree.

"Care in plucking the pods at some given and uniform point of their development, when the largest number of the inclosed fibres are fully developed, and but few injured by over ripeness, appears a likely means of improving the uniformity of staple; the more particularly as the striking want of regularity of Egyptian fibre, in all the three important particulars of strength, length, and fineness, is supposed to arise from the *wholesale* mode of gathering the crop practised there, (viz.), by whole fields at a time, instead of by single pods as they ripen.

"The fibre should not be exposed to the air after being plucked, or as little as practicable, and it should undergo the least possible shaking or handling before and in the process of packing.

"The fibres of extra fine cotton are inclined to twist together and mat and form nips when handled, and are so matted together by some planters in their processes of cleaning and packing as to be deteriorated 1*s*. per pound.

"The cotton cannot be sent home too open, as far as respects the subsequent processes it has to undergo in being spun,—the best state being that in which it is when separated from the seed by *hand*, and in that state put into the bag.

"The best mode of learning the opinions of spinners on experimental samples of Sea Island cotton, appears to be that adopted by Mr. K. Burden, 30 years ago (viz.), for the planter to inclose in one or more of the ordinary bags of his crop, packed at different periods during the season, small packets containing 4 to 10 lbs. weight of the cotton, the quantity of which (as estimated by the spinner) he wishes to learn, and to inclose in such pockets letters addressed 'To the spinner into whose hands this pocket falls,' *defining the points on which the grower seeks information, and asking for a communication on the subject by post, giving at the same time the grower's address.*

"The writer of the foregoing views was thus led to open a correspondence with Mr. Kinsey Burden, which was continued for some years. and led to communication with the agricultural societies of South Carolina, and otherwise to the introduction of select seed-cotton now forming an important branch of the Sea Island trade.

(Signed) "H. HOULDSWORTH."

I can add nothing to these answers which would in the least enhance their practical value, coming as they do from gentlemen whose large experience and eminent practical knowledge cannot fail to render their views useful to the cotton-planters of the United States, and it has afforded me great pleasure to have had the opportunity of procuring their opinions upon the points raised.

I have, in conclusion, to apologise for the delay in making this communication; but, owing to the absence of Mr. Houldsworth from home, and other circumstances, he was unable to reply before the 8th of October, and his communication did not reach me until yesterday.

I have, &c.
(Signed) GEORGE WALLIS.

Memorandum of the substance of a communication from Mr. Le Weeks to Mr. Wallis, dated November 28, 1853.

On raising "Upland" Cotton Seed.

FOR the last ten years there has been an annual importation of seed into south-western Georgia. The seed, however, is not unfrequently grown in that cotton-growing region, and is often produced by the planter himself; as occasionally in passing through a plantation when in full season of fruit-making, a stalk will be found remarkable for the sound healthy appearance of every part, for the thick-set fruit or bolls, for the number and closeness of its limbs, and also the large size of the bolls well filled with a good bodied fibre. This attracts the planter's attention, and he has these bolls carefully saved from time to time as they mature. In due season he plants the seed thus obtained entirely away from his other crop, and soon obtains seed enough for his own use, and that of others also.

Probably thirty varieties of short staple or "upland" cotton can be enumerated in the county of Stewart (Georgia) alone, each at the outset of its career being celebrated for some peculiarity that ostensibly commended it to the notice of the planter. In this way varieties have been mixed and mingled until it is certain that there is scarcely a crop grown in the Chatachoochee river and its vicinity, of a pure species. Twenty years ago it was chiefly understood that all cotton was grown from varieties known as "petit Gulf," "royal Gulf," and "green seed."

It may be concluded, inferentially, that to this cause, viz., the mixing of varieties, may be attributed many of the perplexities of the spinner from irregular fibre. As to length, two kinds have had to be abandoned, the "*silk*" and "*Mastodon*," which always promised finely as field prospects; but from the length of fibre were wholly impracticable in ginning. The fibre is too long for the kind of gins used in south-western Georgia.

Some planters contend, in order to justify the mixing of varieties, and that too with some plausibility, that the tendency of cotton in the climate of the Southern States of America is to deteriorate, and that in order to recover the loss, it is necessary to plant mixed varieties as a remedy.

Mr. Le Weeks' own opinion on this point, although he confesses to having many respectable authorities against him, is that "*every crop planted should be a pure variety*," and to preserve against the falling off in successful production, there should be a change of the seed, say from river lands to high uplands, from gray sandy soils to red clayey or stiff soils, and *vice versâ*.

On the preparation of Land and the cultivation of "Upland Cotton."

The ordinary preparation of land is, first, running a furrow with a small plough, and repeating the same at such a distance apart as the land will allow, according to productiveness. This distance varies from 2½ feet to 5 or 6 feet, the controlling object being to have the space nearly "locked" by the extension of the limbs or side branches when the plant is maturing, care being taken not to be too close, as the "bottom," or first matured bolls, need air and sunshine to open them. At that period they are under the growing foliage of the plant above them, and if they are too much in the shade they rot in the unopened state.

The land is then made into "ridges" by turning on each side of this furrow one-half of the earth each way to the first or guide furrow. At planting, a small plough is run on the top or centre of this ridge, a field-labourer follows and strews the seed with a cast of his hand, say ten to twenty seed per foot. Another labourer follows with a horse drawing a plough-stock with a straight-edge plank or iron fixed, instead of the plough, and covers up the seed by striking the loose earth into the furrow and filling it up.

After the seed is up, the plough is run round the cotton, turning up the earth from the young stems. The hoes (about 10 inches wide) follow and chop through the drills the width of the hoe, leaving a few young plants, say at every 10 inches. Another plough follows the hoes and throws the earth back again upon the cotton to preserve the ridge.

The next time the cotton is gone over, it is put to a "stand," *i.e.*, all superfluous plants are taken out, leaving one only standing at the proper interval to be cultivated.

This is a time of much interest and anxiety to the cotton planter, for after he has brought his crop to a "stand" every stalk or plant lost is a loss to his crop. The disasters at this stage, as also previously, are:—

1st. "*Rust*," "*sore shin*" or the sickly dwindling and death of the young plant, it being as tender as a cucumber, bean, or other vegetables which bring up their seed on their first development.

2nd. "Lice," an insect in all respects similar to those which infest cabbage, &c. These prey upon the sap of the leaves and exhaust it, producing death to the plant.

3rd. "*Cut worms*" or "*wire worms*," so generally known to gardeners, burrowing by day, and appearing at night in search of food, cutting the stem or main stalk off. These often continue to infest the plant until it is 10 to 20 inches high, and then ascend near to the extremities and lop off the buds or ends of the branches.

After the crop begins to make its first "set" or crop of bolls, say in August, the "boll worm" is then the common enemy, its immediate progenitor being a *moth* or *miller*, somewhat smaller than the silkworm species. This insect too is nocturnal, lays one or more eggs in the extremity of the limbs. The young worm on appearing feeds first on the little tender bolls just "set," then advancing towards the centre, takes the next, as it is a few days older and the worm stronger, and so on until the fully matured boll is attacked, and here this insidious insect finds its farewell banquet. Thus this worm will in two months destroy one-half of the planter's prospective crop. It is, however, the least of the disasters to which the cotton-plant is subject. Showers of rain too are very dangerous when the blossom is open, as one drop of water falling within the blossom the first day it opens, ruins it.

Blossoms open white in colour the first day, and red the second, which is also the last. They open from 10 A.M. to 3 P.M., and on the third day fall off.

On gathering and housing "Upland" Cotton.

The time of commencing to gather cotton varies from 10 to 30 days in different years. This variation is brought about essentially by the difference in the seasons, owing to cold backward springs which always prevent the plant from growing off. Long droughts also suspend its growth when planted, as also wet weather after the first bolls are grown.

Generally some portion of the cotton is "picked" out during the last half of August. An acre of land which will produce 1000 lbs. weight of cotton *unginned* will yield from 50 to 150 lbs. the first picking. If the weather be pure, dry and sunny, it will in three or four weeks be 300 to 500 lbs. for the next "picking." The balance will be opened soon after the next killing frost, say in November. Thus may be understood the planter's technicalities of "bottom," "middle," and "top" cotton. "Bottom" and "top" cotton are inferior to the middle; as the "bottom" is near the ground it does not "flush out" when opened, and is likely to be dirty from earth. The "top" is grown when night dews, &c., are cooler, and is more tardy in maturing. Besides, the vigour of the plant is somewhat exhausted, hence its inferiority is a want of perfect development. The "middle" cotton is that which constitutes the most desirable sample, provided rains and winds do not injure its appearance.

The process of picking is as follows: Each field-hand or labourer has a canvas sack suspended around his neck, and hanging down nearly to his knee, into which he may put from 10 to 20 lbs. Having a large basket standing half way, when his sack is full he places its contents therein, and again proceeds with his "picking." At noon and in the evening a waggon and team is sent round to convey the baskets when filled to the gin-house. This proceeds until the whole crop is "saved" or housed.

A fruitful source of the admixture of irregular fibre of unequal length, strength, and fineness, may occur here in continuing to gather the "*bottom*," "*middle*," and "*top*" cotton, and housing these various grades indiscriminately in the same bulk.

A bulk sometimes equal to the whole capacity of the gin-house, as to room and power to support weight, will be got together; and as the gin stands on one side, and its feeding is done from the bulk without selection, a portion of the *first* and the *last* "picking" may be packed together in the same bale.

G. W.

APPENDIX No. III.

Class XII.

Description of the Bay State Mills, Lawrence, Massachusetts.

(With Illustrative Plans.)

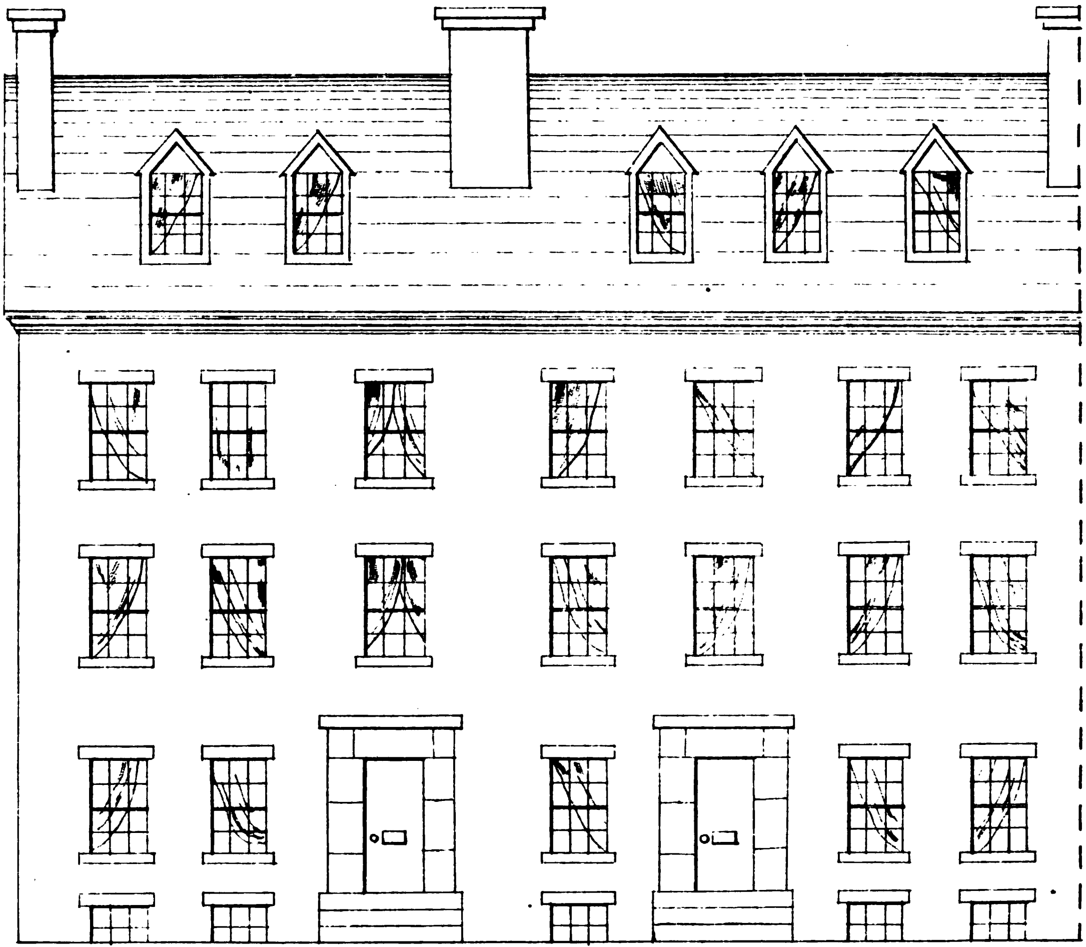
Extract from the Report of the Sanitary Commission of the State of Massachusetts, 1850

The manufacturing establishments at Lawrence have been erected under favourable circumstances. They were planned and constructed under the scientific skill and practical experience which had been acquired by wise and successful men, in a series of years, in other places, aided by excellent water-power, ample capital, and under reasonable national and state legislation. The results have appeared to us so admirable, and so highly worthy of imitation, that we have supposed we could not perform a more useful public service than to give a more particular description of one of them. It will show, in a favourable light, the intelligence, the enterprise, and the liberality that has generally presided over all the affairs of this town.

The establishment belonging to the "Bay State Mills" is devoted to the manufacture of cassimeres, shawls, and other fancy woollen goods, and was planned and erected under the general superintendence of Samuel Lawrence, Esq. It is the largest mill of the kind in the world, and will consume, when in full operation, more than 2,000,000 lbs. of wool annually. The mills occupy a parallelogram of 1,000 feet in length by 400 feet in breadth, between the canal and the Merrimack river. Buildings are erected on the outer borders of this site, affording a spacious central area. That on the river side is 1,000 feet in length and 40 feet in breadth, with two wings, at right angles, at the ends, 240 feet by 40 feet, and outer porches for ingress and egress. The whole is three stories in height, excepting the centre, 52 feet by 42 feet, which is five stories high. On the side next the canal is another line of buildings, 800 feet in length, 38 feet in width, and two stories in height, designed for counting-rooms, store-houses, watch-houses, and other purposes. Within the interior the three principal mills are erected, each 200 feet by 48 feet 8 inches, containing, including the basement and the attic, 9 working floors. All these mills are substantially built of brick, and covered with slate. The rooms are 11 to 13 feet in height, and are warmed with steam, and lighted with gas. The apparatus for warming consists of wrought-iron pipes, 1, 3, or 4 inches in diameter, placed in three, four, or five parallel lines around the interior of the building, immediately under the windows in each story, maintaining in all the rooms, at all times, a uniform temperature of about 68°. A structure to supply the steam is situated in each wing of the river building, and has 12 boilers, and a chimney 135 feet in height. All the rooms are provided with hydrants, to which force-pumps and hose are attached, that may be used in case of fire, for washing, and other purposes. A person is employed in each room to keep every part of it and the stairways clean. Each mill is also provided with extra porches, one in front and the other in the rear, and with four iron ladders reaching from the bottom to the top, for ascent or descent in case of fire, or for any other purpose. The motive power for these mills is obtained from seven breast-wheels of the first class, 23 feet 4 inches in length, 26 feet in

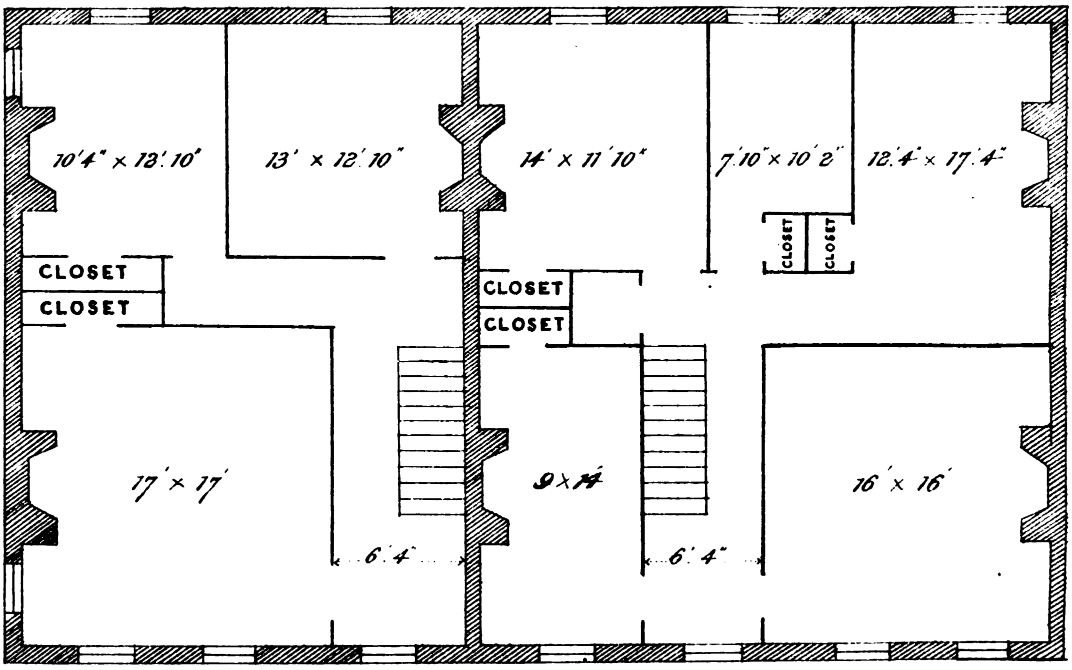
PLANS OF THE BOARDING HOUSES FOR OPERATIVES
BELONGING TO
THE BAY STATE MILLS, LAWRENCE, MASSACHUSETTS.

Enlarged from the Sanatory Report of the State of Massachusetts.

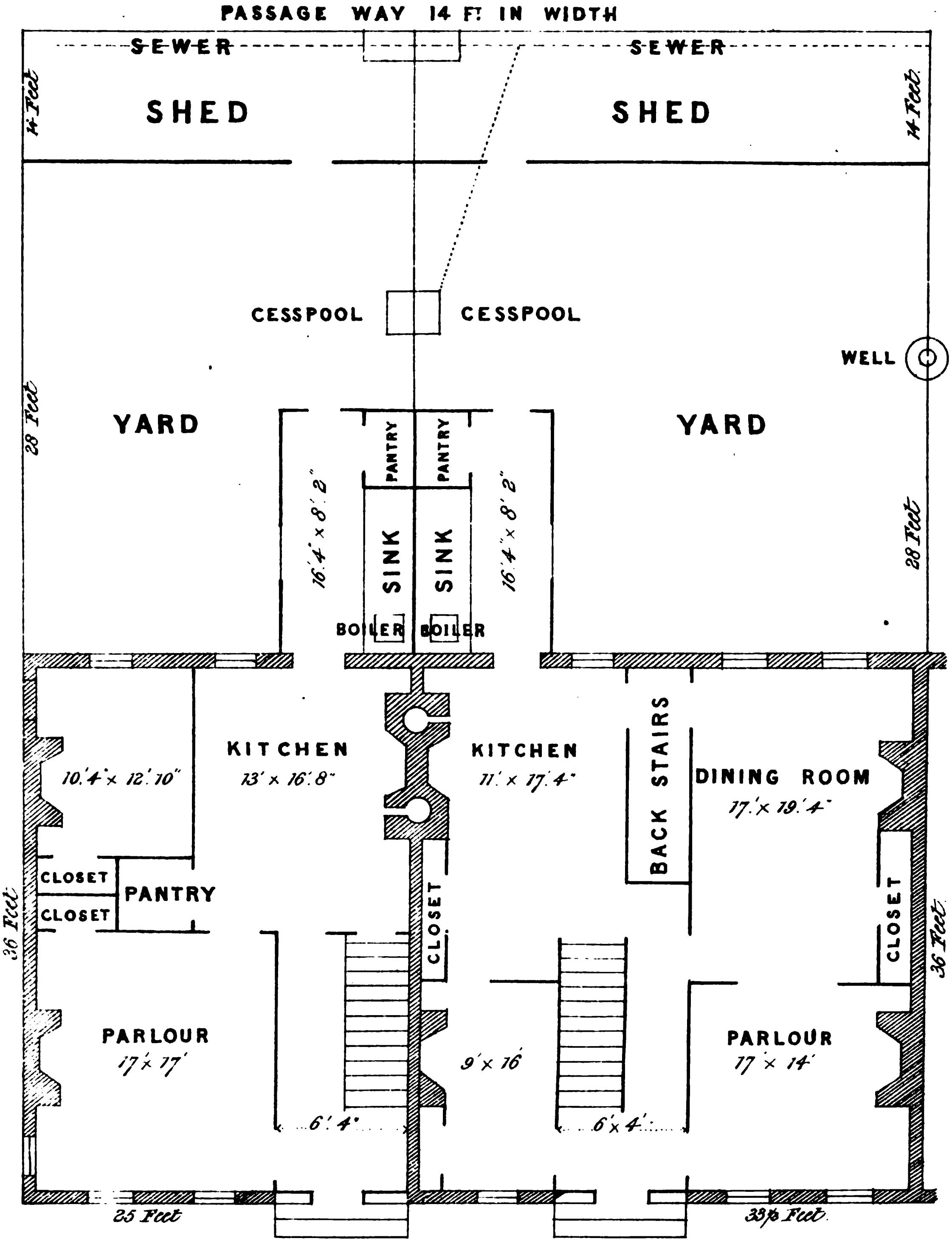


END HOUSE IN THE BLOCK. SECOND HOUSE IN THE BLOCK.

SECOND & THIRD FLOORS.



George Wallis.



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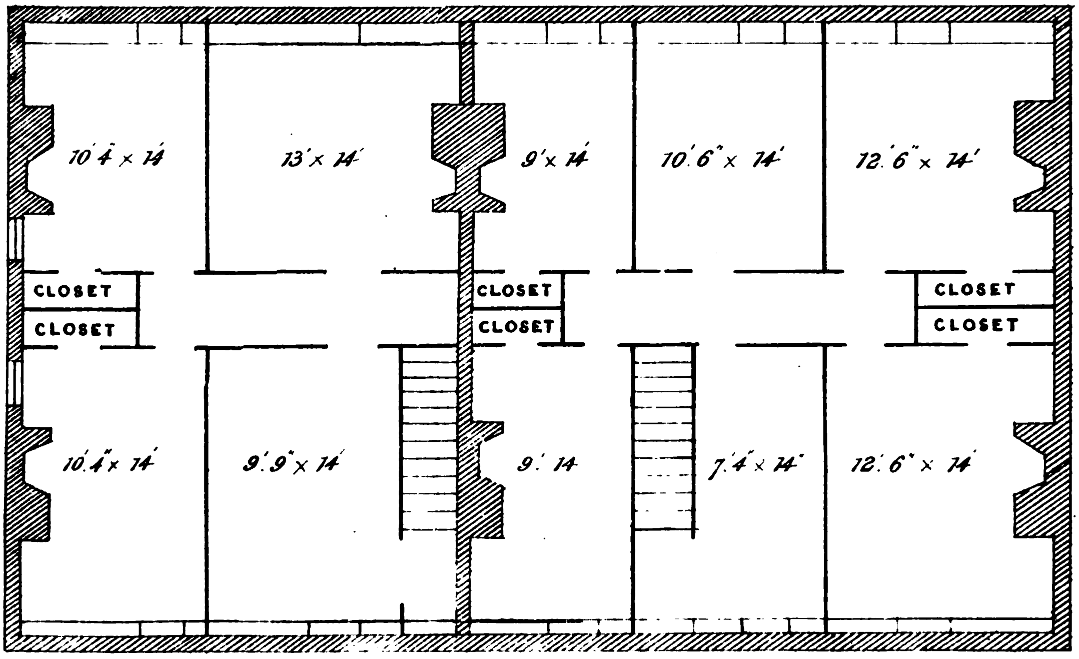

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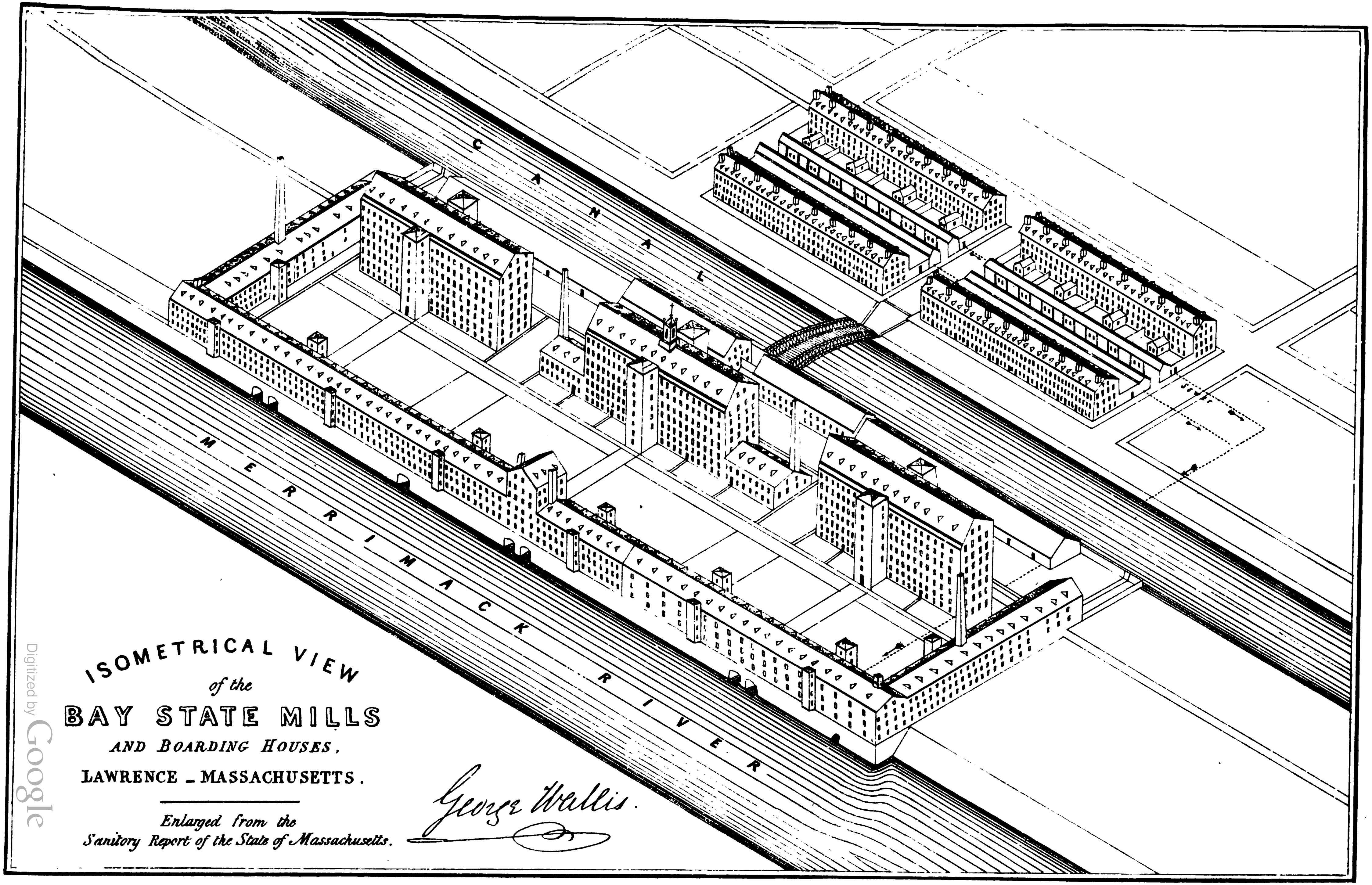

ISOMETRICAL VIEW
of the
BAY STATE MILLS
AND BOARDING HOUSES,
LAWRENCE _ MASSACHUSETTS.

Enlarged from the
Sanitory Report of the State of Massachusetts.

George Wallis.

London: Harrison & Sons.

diameter, and of 125 horse-power each, two of which are placed in each principal mill, and one in the river mill. Eight mill-powers were purchased by this company.

The boarding-houses are on the opposite side of the canal, and consist of four blocks, substantially built of brick, and covered with slate, each 250 feet in length, 36 feet in breadth, 3 stories high, of 10, 9, and 8 feet respectively, with 4 L's in the rear, 1 story high, to each block. Each block contains 8 tenements, and each tenement, except the end one, 33½ feet in width and 36 in depth, exclusive of the L, and contains 20 rooms, including the attic, and is designed to accommodate 36 boarders. The location and size of the rooms will appear from the accompanying plan and illustration. The end houses are 25 feet in width, a little smaller than the others. The houses in each block, except the end ones, are like that on the right of the plan here presented. As you enter this tenement on the left there is a small room appropriated exclusively to the mistress of the house. At the right are two dining-rooms, connected by folding doors, each forming pleasant sitting-rooms at other than meal times. Passing through the entry you enter the kitchen, which is furnished with all necessary conveninces. Beyond this is the back kitchen, containing a large boiler and conveniences for other household purposes. In the rear of this is the wash-room, from which you pass into a large yard, inclosed by a high tight fence, having at the end the wood shed, 14 feet wide, and the privies, the whole bordering on a common passage-way 14 feet wide. Under each alternate fence is a double cesspool, serving for two houses, and having an underground passage leading to the common sewer under the sheds. A well of pure water is connected with every four tenements, and all are supplied with soft water, for washing and other purposes, by cast-iron pipes leading from cisterns in the mills to the sinks in the several houses. On the second floor is the parlour and also the sick-room, a small chamber with a fireplace, designed for an invalid who may need seclusion and extra warmth. Besides these, are sleeping apartments for the boarders in the second and third stories and in the attic, designed to accommodate two, four, or six persons each, according to the size of the room. Each tenement cost about $4,000, exclusive of the land, and will compare to advantage with respectable dwelling-houses in Boston, and are much better than the average in country villages.

To protect the health of the inmates, underground sewers are constructed under the sheds in the rear of each block, through which a current of water, supplied by iron pipes connected with the canal on the left or above the block, is constantly running, carrying off all the contents of the privies, cesspools, and other filth, and passing at right angles under the canal, discharging them into the river, preserving the houses perfectly free from offensive smells. A plan of these sewers may be seen in the accompanying illustration. *Thirty thousand dollars* was expended by this company in their construction alone, for the benefit of the health of the operatives!

Labour begins, or the gate closes, at five o'clock a.m. from May 1 to September 1, and at ten minutes before sunrise the remainder of the year. A firs bell is rung about forty minutes before, to allow time to prepare for work. *Labour ends* at half-past seven p.m. from September 20 to March 20; at seven from May 1 to September 1; and at fifteen minutes after sunset for the remainder of the year. Dinner during the whole year is at half-past twelve p.m. Forty-five minutes are allowed for each meal.

The number of operatives at present employed in these mills is 1,867, of whom 956 are males, and 911 are females. When entirely completed and in full operation, they will employ about 2,500, and require a town population of 7,500. The principal part of the operatives work by the job, the males earning on the average about $5 80 cents per week, and the females about $2 75 cents per week, besides board, which is $1 50 cents to $2 per week for males, and $1 25 cents for females. The females are principally inmates of the boarding houses. Most of the males, however, have houses of their own, or board elsewhere.

The boarding houses for the accommodation of the operatives in these mills, as in other manufacturing establishments, are owned by the corporation. They have been erected, not for an investment of capital on which a profitable income is to be anticipated, but as a means of preserving a proper supervision over the operatives employed and for their benefit. Boarding houses of this kind generally afford less than 4 per cent. interest on the capital invested. Some afford no income at all, and even become an annual expense to the owners. They are kept in repair and rented to the tenants, subject to such regulations and restrictions as the company see fit to establish. The rent and price of board are fixed by the company, but both are subject to such alteration as the circumstances of the times, and of all the parties interested, shall render just and proper.

The tenants of the Bay State boarding houses now pay $150 each annually, which is about *three per cent.* on the cost. The furniture of the houses is obtained and owned by the tenants themselves, and they furnish provisions and other articles of consumption for the inmates. They now receive $1 25 cents per week for the board of females, and $1 75 cents to $2 for males. The fare provided is of a plain, substantial, and wholesome kind, well prepared, neatly served, and in sufficient quantities. Operatives are under no compulsion to board in one tenement rather than in another; it is for the interest of the boarding-house keepers, therefore, that the bill of fare should be attractive and satisfactory. The keepers are sometimes men with wives and families, but they are generally widows, or females who have been accustomed to perform the principal part of the business of providing for their families, and who desire a remunerating means of subsistence. Applications for these situations are generally numerous, but they can be obtained by none but persons of known capacity and respectability; and whenever indications of a different character are manifested, the obnoxious keeper is immediately ejected. Males and females are not allowed to occupy the same house, not even a man with his wife, as boarders.

Several classes of regulations to be observed by the inmates of these houses are printed and placed conspicuously in each house. One code is as follows:—

"1.—The tenants must not underlet any part of their tenement, nor board any persons not employed by the company, unless by special permission; and in no case are males and females to board in the same house.

"2.—The tenants must, when required by the agent, give a correct account in writing of the number, names, character, habits, and employment of their boarders, and whether they are habitual attendants on public worship. They must also, on the first Monday of every month, send to the counting-room a list of all the boarders they have taken, and of all who have left their houses during the preceding month. They must also, at the same time, render a list of the names of all such boarders as have required the services of a physician, on account of sickness, during the same period.

"3.—The doors must be closed at 10 o'clock in the evening, and no one admitted after that time, unless some reasonable excuse can be given.

"4.—The boarders must not be permitted to have company at unseasonable hours.

"5.—All improper conduct among the boarders, and all rude and disorderly deportment, must be prevented by the tenants, if possible, and if persisted in must be reported to the agent.

"6.—It is confidently expected that all children over 12, and under 14 years of age, living in the houses, be kept constantly at school.

"7.—It is indispensable that all who live in the houses should be vaccinated, and this will be done at the expense of the company, by a physician, at the counting-room, for all those employed by the company and for the families of the tenants.

"8.—The health of the inhabitants requires that particular attention should be paid to the cleanliness and daily ventilation of the rooms.

"9.—No water, nor filth of any kind, must be thrown out in front of the houses, nor be allowed to remain in the cellars, backyards, or sheds.

"10.—Ashes must not be kept in wooden vessels, nor will any carelessness be allowed in the use of fire or lights. Neither camphine nor any other explosive compound used for lights will be allowed on the premises.

"11.—The rooms must not be mutilated nor defaced, and in all cases where the plaster of the walls is broken, either by driving in nails, screws or pins, or by rubbing with furniture, or by any carelessness, or by any other means beyond ordinary use and wear, the injury will be repaired, and the cost thereof charged to the person leasing the house.

"12.—A suitable chamber for the sick must be reserved in each house, so that they may not be annoyed by others occupying the same room.

"13.—Window glass must not be allowed to remain broken longer than one day.

"14.—Wood and coal will not be permitted to be taken into the cellars, nor from them, through the front windows.

"15.—The closest supervision will be exercised to enforce these rules, and the tenants themselves are particularly required to pay close attention to them, and to insist upon their observance on the part of their boarders.

"16.—No tenement will be leased to persons of immoral or intemperate habits, and any tenant who, after occupancy, shall be found to be of such habits, or to receive boarders of such habits, will be notified to vacate the premises.

☞ *The tenants are particularly desired to lend their aid in the preservation of the trees in front of the houses, and to give immediate information to the agent if any injury be done them.*"

Similar regulations are issued by the Atlantic Cotton Mills, besides an additional code, one section of which is the following:—

"A proper observance of the Sabbath being necessary for the maintenance of good order, all persons in the employ of this Company *are expected to be constant in attendance at pnblic worship,* and those who habitually neglect this regulation, or who are known to attend improper places of amusement, will be discharged."

The execution of these and other police regulations of the whole establishment is entrusted to the general agent, who, by his known capacity, his experience, and his character, is fitted for the station. Under his wise and systematic supervision, the boarding-houses and all the departments of these extensive mills are managed with the same care as a small well-regulated family.

The influence of the system by which the boarding-houses are regulated is immensely beneficial, whether we consider it in a social, moral, or sanatary point of view. It is an influence which is felt by all the operatives, at all times, while they are out of the mills as well as in them. In the boarding-houses too, a care, attention, and oversight is frequently exerted by the landlady over her boarders, which is nearly allied to that which a kind parent exerts over her children, and which produces almost as strong a mutual attachment in the one case as in the other.

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NEW YORK INDUSTRIAL EXHIBITION.

SPECIAL REPORT

OF

MR. JOSEPH WHITWORTH.

Presented to the House of Commons by Command of Her Majesty, in pursuance of their Address of February 6, 1854.

[1718]

[74]

LONDON:
PRINTED BY HARRISON AND SON.

RETURN to an Address of the Honourable the House of Commons, dated February 6, 1854;

for—

"Copies of the Reports made to the Foreign Office, or to any other Department, by the Commissioners appointed to attend the Exhibition of Industry in the City of New York."

MR. WHITWORTH'S SPECIAL REPORT.

HAVING been unavoidably prevented, as explained in the General Report of the Commission, from making a report upon the Machinery exhibited in the New York Industrial Exhibition, I have drawn up in a concise form the results of observations made while visiting the principal seats of those manufactures which came within my department.

The statement thus prepared embraces a variety of subjects, somewhat miscellaneous in their character, and which do not conveniently admit of a regular classification. I have endeavoured, however, as far as possible to overcome this difficulty, and to adopt an arrangement by which the substance of the information which I collected may be distinctly and fully appreciated. This Report does not affect to embrace the whole scope of American manufactures, nor even to exhaust the interest of those particular departments upon which it touches; it is merely intended to direct attention to such facts connected with the Machinery of the United States as came within my observation, and which it appeared desirable should be known to those engaged in mechanical and industrial pursuits in this country.

To the general reader many of the descriptions of manufacturing processes will, I am aware, be uninteresting, and in some cases perhaps unintelligible; for, looking to the persons for whose information I have more immediately written, I have thought it proper to adhere to those technical terms which are in use among men who are more or less acquainted with the application of mechanical science. For instance, when in describing a cotton mill in America I have said, "One man can attend to a mule containing 1,088 spindles, each spinning 3 hanks, or 3,264 hanks on the average per day," I am aware that I am using technical language incomprehensible to the ordinary reader, but these few words convey all the requisite information to those practically acquainted with the subject. I have not, therefore, attempted to impart a popular tone to the Report; and the very few general reflections which I have ventured to offer, are given at its close.

Some works have been noticed for their novelty and interest, others for their practical utility as affecting our native industry, and in some instances the information which I have collected has been directed to convey a general idea of the extent to which particular branches of manufactures are developed, of the conditions, as to management, under which they are carried on, and of the causes to which their flourishing condition is chiefly due.

The accidental absence of principals at the period of my visits, the limited time at my disposal, and my anxiety to embrace as wide a field of observation as possible, have severally constituted impediments where more minute information might have seemed desirable; but whatever may be the defects of this necessarily imperfect Report, I desire to record my sincere acknowledgments for the great courtesy and the kind attention which I received on all hands during my visit to the United States; I am the more bound to do so as the plan which I have pursued has precluded me from mentioning the names of many gentlemen who so greatly facilitated the objects of my visit, by showing me over their own establishments, accompanying me to those of others, and affording me all the information in their power.

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CHAPTER I.

STEAM ENGINES AND MACHINERY.

New York, Philadelphia, Baltimore, Pittsburgh, Buffalo, Boston, Lowell, Lawrence, Holyoke, Worcester, Hartford, and Springfield.

1. *Number of Establishments visited.*—The vast resources of the United States are now being developed with a success that promises results whose importance it is impossible to estimate.

This development, instead of being, as in former cases, gradual and protracted through ages, is by the universal application of machinery effected with a rapidity that is altogether unprecedented.

Upwards of thirty establishments visited in different parts of the States, and employing in the aggregate from 6,000 to 7,000 men, afforded direct evidence that the greatest energy and attention are brought to bear upon the manufacture of machinery.

2. *Marine Engine Works.*—The principal marine steam engine works are in New York, but there are large establishments of a mixed character in almost every town of importance; to particularise these and to give a full description of each is unnecessary. They are similar in character, and it frequently happens that it is only in some of the details that there is anything to remark upon. The practice which prevails of combining various branches of manufacture in the same establishment, would also render separate descriptions of each somewhat complicated. For instance, in some cases the manufacture of locomotives is combined with that of mill gearing, engine tools, spinning and other machinery. In others, marine engines, hydraulic presses, forge hammers, and large cannon were all being made in the same establishments. The policy of thus mixing together the various branches is objectionable, but the practice doubtless arises, in addition to other causes, from the fact that the demand is not always sufficient to occupy large works in a single manufacture.

Wherever facilities of carriage or other causes render it practicable to confine establishments to a special branch, the most advantageous results ensue. This was very evident in numerous and striking instances which will be hereafter noticed.

It is to the introduction of railroads that the advantageous subdivision of manufactures is to be chiefly ascribed. The operations of large establishments are no longer confined to particular localities: the facilities of transport being so great, they are enabled to supply their special products not only to a district or a kingdom, but to the world at large.

It is evident that isolated notices of details made in various places must have a disconnected character, and it is therefore convenient to mention in separate paragraphs what appeared worthy of remark.

3. *Locality of Works.—Beam Engines.*—Nearly all the marine engine works in New York are conveniently situated on the water side, and have slips attached to their yards, where vessels may be moored. The rise and fall of the tide is generally so small as to obviate the necessity of docks. Steam engines having their beams above the deck, are commonly used for the river and ferry boats, and they have generally a very long stroke. The following are some of the dimensions of a beam engine of one of the New York river steamers.

Length of stroke, 12 feet; length of beam, 24 feet; depth of beam in the middle, 10 feet. The form of the beam is that of an elongated parallelogram, the outer frame or skeleton is made in one piece of wrought iron, inside of which is fitted another frame of cast iron, carrying the axis.

4. *River Steamers for Shallow Waters.*—A steam-boat running on the Ohio from Pitsburgh to Cincinnati, had a pair of direct acting engines with 32 inch cylinders and 8 feet stroke. There was no main crank shaft connecting the two paddle wheels, but each engine worked its own wheel independently of the other. This arrangement enables the boat to be steered with greater facility round the sharp turns encountered in the tortuous course of the river. The framework and outer bearings of the paddle-wheels are supported by suspension rods, which are, as it were, slung over beams, and framework strongly constructed and fixed in the centre of the vessel. The main deck is 280 feet long, and 58 feet wide. The paddles are 38 feet in diameter, having twenty-four floats, 12 feet wide by 28 inches in depth. For shallow rivers, flat-bottomed steamers propelled by a paddle-wheel at the stern are commonly used. Two were being built of iron in New York, drawing only 2½ feet of water, which are intended for the passage across the isthmus of Panama by the Nicaragua route.

5. *Lake Steamers.—Propellers.*—A marine engine establishment at Buffalo was principally occupied in making engines for screw steamers intended for lake and river navigation. The propellers of those intended to run in shallow waters are made with four, and sometimes six blades, each, and revolve with rather less than half their diameter immersed in the water. The blades are made of wrought iron, and bolted on to a cast-iron boss, fitted on the propeller shaft, so that a blade broken or damaged by coming in contact with "snags," or other obstructions, may be easily replaced. Some of the dimensions of the machinery in a lake boat, used for carrying cargo, are as follows:—The propeller is 16 feet in diameter, with a pitch of 17 feet 3 inches, making 60 revolutions per minute; the cylinders are 36 inches in diameter, with a 10 feet stroke, and the speed attained averages about eleven miles per hour. The vessel has an upper deck for the accommodation of about sixty passengers. Small high-pressure steam engines for flour mills, agricultural implements, and other machinery, are made in the same establishment.

6. *Caloric Engines.*—Ericsson's caloric engines were undergoing repair and alteration in New York, with the view of making the heated air act alternately upon each side of the piston, similarly to steam in an ordinary engine. The bottom of the cylinder is made of wrought iron, and arched. The upper part, in which the piston works, is of cast iron, and is connected to the lower part by bolts: it was this lower portion which proved defective in strength.

It was expected that the vessel, with her caloric engines, would be again ready for sea in the course of two or three months.

CHAPTER II.

PROCESS OF CASTING, COOLING, &c., RAILWAY WHEELS, AND ANNEALING—RAILROAD SPIKE MAKING—NAIL AND RIVET MAKING—CAST-STEEL WORKS—ENGINE TOOLS.

Pittsburgh, Philadelphia, Lawrence, Worcester.

7. *Iron Castings.*—The iron castings in some of the establishments were very good, and cylinders from 8 to 14 feet in diameter were well bored, with a finishing feed of cut of about three-eighths of an inch per revolution, which is at a width of cut at least three times as great as that ordinarily given in English works.

At Pittsburgh a large casting for a hydraulic press was cooled by the following method:—Water is introduced into the interior of the core by a pipe, which extends to the bottom, and fills it previous to casting. Provision is made for the escape of the air by making the core fluted.

When the metal is poured into the mould it immediately heats the water, which is then drawn off by an escape pipe at the top of the core, and a supply of cold water is continually running in at the bottom.

Heat is thus gradually taken from the mass, and the whole cools uniformly. The casting was 10 inches thick, and weighed 7 tons. It took from three to four days in cooling.

The best charcoal pig iron was selling in Pitsburgh at $45 per ton, having risen within a short period from $30 per ton.

Major Wade, of Pittsburgh, has made many experiments on the tensile strength of this iron. He found that it required a force of 45,000 pounds to tear asunder a bar an inch square. Some of the results of his experiments have been published by the United States Government in the "Ordnance Manual."

8. *Pickling Castings.*—The process of "pickling castings," as it is called, is performed in the following manner:—

The castings are placed on two wooden stages, covered with lead, each being 20 feet by 12 feet wide, and supported by two rollers, about 18 inches from the floor.

The trough containing the pickle (which consists of 2½ parts of water to 1 of acid) is of the same length as the stages, which are inclined towards it, to enable it to receive the drainings. The diluted acid is poured over the castings by hand from a long ladle, and when they are dry, the operation is repeated as often as necessary.

The stages are then inclined in the opposite direction, and cleansed from the coating of acid and sand by a powerful stream of water directed upon them from a hose pipe.

In England when the process of pickling is adopted for light castings, it is usual to immerse them in the liquid. The American method was probably adopted in consequence of the high price commanded by manual labour.

9. *Annealing Railway Wheels.*—The leading and trailing wheels of locomotives, and railway carriage-wheels, are commonly hollow cast-iron disc wheels.

The process of annealing adopted in a large manufactory in Philadelphia is as follows:—

The wheels are taken from the moulds, as soon after they are cast as they can bear moving without changing their form, and before they have become strained while cooling. In this state they are put into a circular furnace or chamber, which has been previously heated to a temperature about as high as that of the wheels when taken from the mould; as soon as they are deposited in this furnace or chamber, the opening through which they are passed is covered, and the temperature of the furnace and its contents is gradually raised to a point a little below that at which fusion commences. All the avenues to and from the interior of the furnace are then closed, and the whole mass is left to cool gradually as the heat permeates through the exterior wall, which is composed of fire-brick 4½ inches thick, inclosed in a circular case of sheet iron ¼ inch thick.

By this process the wheel is raised to one temperature throughout before it begins to cool in the furnace, and, as the heat can only pass off through the medium of the wall, all parts of each wheel cool and contract simultaneously. The time required to cool a furnace full of wheels in this manner is about four days.

By this process wheels of any form, and of almost any proportions, can be made with a solid nave.

The manufacture of these wheels was commenced in 1847, and in 1850 15 tons weight were cast per day. The foundry and works as now completed are calculated to turn out 40 tons per day.

In another establishment the wheels while hot are lifted from the mould, and the centre part is placed in a hole communicating by means of a flue with a high chimney, and the edge is packed round with sand. A draft is thus created which cools the mass of iron near the centre of the wheel, and in some measure prevents it from contracting unequally during the operation.

At a foundry in Worcester, the wheels when cast were taken hot from the moulds, and immersed in a pit of white sand, where they are left to cool gradually.

In order to obtain the best chill, it is considered necessary to use cold blast iron made with charcoal.

10. *Railroad Spikes.*—There is a large demand for railroad spikes in the United States.

On nearly all the railroads the rails are laid on transverse wooden sleepers, and are simply fastened down by large iron spikes with projecting heads, except at the junction of two rails, where the ordinary chair is employed.

In a manufactory at Pittsburgh, a machine was at work which made these spikes, each weighing ½lb., at the rate of 50 per minute. They are packed in kegs, each containing 300. Seven men only are employed on the works, and they manufacture 5 tons of spikes per day.

11. *Nails and Rivets.*—In another establishment at Pittsburgh, 250 men are employed in manufacturing bar iron, rods, sheets, and nails. The iron is manufactured both with anthracite coal and charcoal.

They have 51 machines for making cut nails, many of them are self-acting in the feeding for the smaller sizes, the strip of iron is inserted in a tube, which is made to revolve alternately half round each way.

They make 2000 kegs of such nails per week, each weighing 100 lbs., and containing sizes from fourpenny up to tenpenny nails.

A rivet-making machine was at work which made rivets weighing 7 to the pound, at the rate of 80 per minute. Its main shaft carried two cams, one a side cam which gave the motion for cutting off and holding the iron between the dies, the other a direct cam for forming the head of the rivet.

The cams for the nail machines are made of chilled cast-iron, and that part of the lever which acts against the cam is faced with a plate of bell-metal. Several large grinding stones were used, having mouldings on their peripheries for restoring the dies when worn.

It is usual in England to soften the dies by annealing previous to restoring their shape, and again hardening them subsequently. The shape may be thus more perfectly restored, but at a greater cost, and the operation of softening and re-hardening deteriorates the quality of the steel.

12. *Cast Steel.*—The manufacture of cast steel is not carried on to any great extent. Some works have been started in Pittsburgh, which have hitherto met with great difficulties, but they are now more successful.

Workmen were obtained from Sheffield, but they were intractable, and failed to give satisfaction to their employers.

There were 2 converting and 9 melting furnaces, producing upwards of 2000 lbs. per day.

The steel sells at 17½ cents. per pound (8¾*d.*)

13. *Engine Tools.*—The engine tools employed in the different works are generally similar to those which were used in England some years ago, being much lighter, and less accurate in their construction, than those now in use, and turning out less work in consequence.

The proportion of slide to hand lathes is greater than in the generality of English workshops.

Planing and drilling machines are commonly used; but there are comparatively very few horizontal or vertical shaping machines, and a considerable amount of hand labour is therefore expended on work which could be performed by machines much more economically.

The foundries are, for the most part, large and well arranged, and are furnished with good powerful cranes.

Great anxiety is now manifested by many manufacturers to have engine tools of a better description than those in use; and before long there will, no doubt, be great improvement in this respect.

CHAPTER III.

BUTTONS—DAGUERREOTYPE FRAMES—PINS—HOOKS-AND-EYES—CUTLERY, &C.

Waterbury.

14. *New Manufacturing Towns.*—The energetic character of the American people is nowhere more strikingly displayed than in the young manufacturing settlements that are so rapidly springing up in the Northern States.

A retired valley and its stream of water become in a few months the seat of manufactures; and the dam and water-wheel are the means of giving employment to busy thousands, where before nothing more than a solitary farm-house was to be found. Such, in a few words, is the history of Waterbury and all the Naugatuck settlements of Holyoke, Chicopee, Lowell, and Laurence. Many others might be mentioned, but allusion is now only made to those visited.

15. *Waterbury.*—Waterbury is situated in the Naugatuck valley, about 24 miles north of New Haven. It contains many manufacturing establishments, carried on principally by joint stock companies. Besides other firms, there are 28 companies of which the greater number are employed in the manufacture of rolled and sheet brass, copper, wire buttons, German silver, pins, cutlery, hooks-and-eyes. The others are employed in manufacturing hosiery, felt, cloth, webbing, covered buttons, umbrella trimmings, leather, &c.

The official statements of these companies show that their respective capitals vary in amount to a very great extent, and that they are in some cases remarkably small:—

There are 2 with a capital of $6000 (about £1200).
5 between $10,000 (£2000), and $20,000 (£4000).
13 - - $20,000 - - $100,000 (£20,000).
And the rest - - $100,000 - - $250,000 (£50,000).

Great facilities are afforded in many of the States for the formation of manufacturing companies. The liabilities of partners not actively engaged in the management are limited to the proportion of the capital subscribed by each, and its amount is published in the official statements of the Company. In the case of the introduction of a new invention, or a new manufacture, the principle of limited liability produces most beneficial results. Persons who from their connections or occupations are likely to be interested in, or profited by, the new invention or manufacture, readily associate together and subscribe capital to give the new proposal a fair trial, when they are assured that their risk will not extend beyond the amount of which they may choose to contribute.

The cost of obtaining an act of incorporation is very trifling; in one case where the capital of the company amounted to $600,000 (£120,000), the total cost of obtaining the act of incorporation was 50 cents (2*s.* 1*d*).

16. *Button Machinery, Buttons, &c.*—Upwards of 200 men are employed by one of the companies in the manufacture of buttons, hinges, daguerreotype plates and frames, &c.

The round-shaped button is formed by two punches, one working inside the other, each being driven by a separate eccentric, and the inside punch having the longer stroke. By this arrangement the disc is forced through the die, and drops into a box, thus saving the labour of picking out, which is necessary where a single punch and solid die are used,

The spindle of the polishing lathe in which the button is fixed whilst being burnished, makes 10,000 revolutions per minute.

17. *Daguerreotype Frames.*—The lathe in which the oval frames used as settings, for daguerreotypes, are turned, has an oval chuck, and a stationary cutting tool fixed to the slide rest, for "trueing out" the previously punched oval. Two milling tools are used, one for forming the bevilled edge, the other for ornamenting the face of the oval frame.

The milling tool, as it revolves, is allowed to swivel so as to accommodate itself to the oval. When the bevilled edge has been formed, the first milling tool is removed and another substituted while the work revolves.

One workman is able turn, and ornament by milling, two gross of frames per day.

18. *Pin and Hook-and-eye Manufactory.*—No description of the machinery used in pin making can be given, as the process of "papering" is all that is permitted to be seen.

The pins are all papered by machinery; they are placed in a shallow feeding dish in an inclined position, so as to allow them to descend gradually as they are shaken by a quick vibratory motion. They fall from the spout of the feeding dish upon the centre of an inclined shallow trough, about 18 inches long, through which runs lengthwise a slit sufficiently wide to admit the shank of a pin, and yet suspend it by its head. It being a matter of chance, when a pin falls from the spout, whether it will drop into the slit or slide down the trough, a sufficient number are allowed to descend to insure the filling of the slit by those which happen to fall favourably.

The superfluous pins slide down into a box, from which they are again lifted from time to time to the upper feeding dish. The descending line of suspended pins is conducted by the slit (which is curved at its lower end) to a sliding frame which is worked by the woman who attends the machine.

The frame carries a dozen grooves, and in each of these a pin is deposited as it passes under the slit; the pins are thus arranged in a row, with their points all turned the same way. The sheet of paper for receiving them is placed by the attendant on a grooved table, and deep folds are pressed into it at equal distances, and into the cross ridges thus formed, a row of pins is pushed by the carrying frame at every thrust forward.

Under no circumstances whatever are strangers allowed to enter the rooms in which the pin-making machines are at work. The workmen employed are obliged to enter into a bond, and find two sureties, that they will not disclose anything relative to the machinery. The company preferred keeping their mode of operation a secret in this way to taking out a patent.

19. *Hook-and-eye Making.*—Three different descriptions of machines are employed in making hooks-and-eyes,—the wire being let in on one side of the machine, and a completed hook or eye dropped out on the other.

The machines appeared to make them at the rate of about 100 per minute.

About 80 hands are employed, who are said to make 1,200 packs of pins, each containing 3,360 pins, and 2,500 gross of hooks-and-eyes, per day.

20. *Cutlery.*—The cutlery and file works were conducted on a limited scale. Many beautifully finished knives were exhibited, and were said to command a higher price than those of a similar class imported from England.

The artizans are employed principally on piece-work.

In the cutlery department a workman was pointed out who earned $70 (about £14) per month, while the earnings of others occupied on precisely the same kind of work only amounted to $30 (£6) per month.

Thus it will be seen that each workman does the best he can for himself, irrespective of others, and reaps the reward due to his superior skill and industry.

CHAPTER IV.

LOCKS—PORCELAIN-HANDLES—CLOCKS—PISTOLS AND GUNS.

Pittsburgh, New Haven, Worcester, Hartford.

21. *Lock making.*—The manufacture of locks appears to be rapidly extending. In an establishment at Pittsburgh employing 350 men in making locks, coffee mills, copying presses, &c., good work was being turned out.

Another at New Haven, Connecticut, employs about 200 men in making locks and lock-handles. The latter are made of coloured clays, so mixed as to present a grained appearance. They are first moulded by hand, then turned in a self-acting lathe with great rapidity, and are afterwards baked in a furnace.

Padlocks are made here of a superior quality to those of the same class ordinarily imported from England, and are not more expensive.

22. *Clock making.*—The celebrity attained by New England in the manufacture of clocks gave a peculiar interest to a visit to one of the oldest manufactories of Connecticut; 250 men are employed, and the clocks are made at the rate of 600 per day, and at a price varying from $1 to $10, the average price being $3.

The frames of the clocks are stamped out of sheet brass, and all the holes are punched simultaneously by a series of punches fixed at the required distances.

The wheels also are stamped out of sheet brass, and a round beading is raised by a press round their rims for the purpose of giving them lateral strength. They are cut by a machine having 3 horizontal axes, carrying each a cutter placed about 4 inches apart. The first cutter is simply a saw, and the second rounds off the teeth. In cutting an escapement wheel, the first cutter is made to cut each tooth entirely round, and then either the second or third axis with its cutter is used for finishing. The pullies on the three axes are driven by one driving pulley with three straps working over and in contact with each other.

The plates forming the clock faces, and other discs, are cut out by circular shears. The beaded rims intended to go round the clock faces, varying in size from 15 inches downwards, are stamped in concentric rings out of a disc, and then made of the required form by means of dies and a stamping press.

The ogee form given to the wooden framing of the common clock is formed by a revolving cutter of the required shape, making 7000 revolutions per minute, over which the piece of wood is passed by hand,—the requisite pressure downwards being given at the same time.

A circular cutter fixed on a horizontal axis is also used for roughly planing the back parts of the wooden clock. Its diameter is about 18 inches, and it has 4 lateral projections, carrying 4 cutters, 2 gouges, and 2 chisels. These revolve round a fixed circular centre plate, of about a foot in diameter, against which the work is pressed as it is passed along. Each clock passes through about 60 different hands: more than half of the clocks manufactured are exported to England, and of these a large portion are re-exported to other markets.

And it is worthy of remark, that the superiority obtained in this particular manufacture is not owing to any local advantages; on the contrary, labour and material are more expensive than in the countries to which the exportations are made; it is to be ascribed solely to the enterprise and energy of the manufacturer, and his judicious employment of machinery.

23. *Guns and Pistols.*—In a large manufactory at Hartford, from 400 to 500 men were employed in making revolving pistols at the rate of from 1200 to 1500 per week.

Self-acting machinery and revolving cutters are used for making all the separate parts, and the tools are made and repaired in a machine shop which is attached to the works.

In another establishment at Worcester, Connecticut, 175 men were at work, manufacturing guns, rifles, and pistols. Revolvers were made in large numbers with barrels on the old principle, and were all proved by hydraulic pressure.

Further particulars will be given respecting this manufacture when the Government establishments are noticed.

CHAPTER V.

WOOD WORKING.

Lowell, Buffalo, Philadelphia, Baltimore, Worcester, New Haven.

24. *Labour-saving Machines.*—In no branch of manufacture does the application of labour-saving machinery produce by simple means more important results than in the working of wood.

Wood being obtained in America in any quantity, it is there applied to every possible purpose, and its manufacture has received that attention which its importance deserves.

It would be difficult to point in any country to a more successful application of machinery to the working of wood than was made in England long ago in the manufacture of ship blocks, by the late Sir Isambard Brunell, aided by the late Mr. Maudslay: other instances of mechanism most ingeniously adapted to similar purposes might also be cited. It cannot therefore be said that in England nothing has been done in this branch of manufacture; but it must be confessed that the improvements which have been made have not been extended, as they might have been, to ordinary purposes, though in this respect a desire for progress is now evidently manifested.

A house in Liverpool is importing the best machines of the kind in use in America, and is making great efforts to introduce them generally in England.

25. *Saw Mills, Lowell.*—The trees sawn up in the Lowell saw mills are floated down from the interior of the country by river; they are docked in a basin in the timber yard, and are dragged up an inclined plane into the interior of the mill as they are wanted.

In an upper story are placed two large saw frames, and between them travels an endless chain, running along the shop floor over pullies, and extending down the inclined plane nearly to the edge of the basin. To any part of this endless chain may be hooked another chain, which, being passed round one or more trees as they lie in the basin, drags them up into the mill and deposits them alongside the saw frames.

Shingles, used for covering the roofs and sides of houses, are made in vast quantities.

A circular saw cuts them 16 inches long, from 3 to 9 inches wide, and of a thickness tapering from $\frac{3}{8}$ to $\frac{1}{8}$ of an inch, at the rate of from 7,000 to 10,000 per day, according to the nature of the wood.

Timber is also cut up into laths 4 feet long, at the rate of from 60 to 100 per minute, by a circular saw attended by two men.

26. *Saw Mills, Buffalo.*—In these saw mills boards were sawn into "sidings," that is, long wedged-shaped boards for the sides or roofs of houses, by a circular saw at the rate of 17 feet per minute. The board is introduced at the back of the saw, and moves in the direction in which it revolves. It thus cuts with the grain, and the strength of the cut assists the forward feeding motion of the board.

Subdivision of manufacture is advantageously adopted as a system.

Many works in various towns are occupied exclusively in making doors, window frames, or staircases by means of self-acting machinery, such as planing, tenoning, morticing, and jointing machines. They are able to supply builders with the various parts of the woodwork required in buildings at a much cheaper rate than they can produce them in their own workshops without the aid such machinery.

In one of these manufactories twenty men were making panelled doors at the rate of 100 per day.

Portable sawing machines, driven by horse-power, are commonly used for sawing up logs of wood for fuel, particularly at the various stations on the railroads, where the wood intended for the consumption of the locomotives is stored in piles.

The "horse-power machine" consists of a stout frame supporting a railway about 7 feet long, on which run the rollers of an endless travelling platform. The axles of the rollers are of iron, ⅝ in diameter, stretching across the rails, and are connected together by a series of links, each about twelve inches long, so as to form an endless chain, which passes over a fixed segment at one end and the chain wheels at the other. The travelling platform is made by planks of wood about 12 inches broad, 1¼ inches thick, fastened transversely to the endless chain. It is inclined at an angle of about 7° to the horizontal line, and the horse being placed on the platform pushes it backward from under him, which causes the chain wheels at the end of the frame to revolve, and the motion thus obtained is conveyed to the circular saw or other machine required to be driven. Some horse-power machines are made to admit two horses abreast. They are found very useful to farmers; when requisite they are mounted on wheels, and may be easily taken from place to place to saw up trees which could not conveniently be moved entire.

27. *Planing Machines.*—A numerous variety of planing machines are in common use. For flooring boards, Woodworth's machine is found to answer very satisfactorily. In planing mills at Philadelphia, four of them were working in one room side by side; they have three cutters on each horizontal axis, having a radius of 6 inches, and making 4,000 revolutions per minute. The cutters are said to be capable of planing from 2,000 to 3,000 feet of work without being sharpened with the oil-stone, and from 20,000 to 30,000 feet without being ground.

They plane boards 18 feet long, varying in width from 3 to 9 inches, at the rate of 50 feet per minute. At the same time that the face of the board is planed, it is tongued and grooved by cutters revolving with a radius of about 3 inches, on vertical axes on each side of the board.

The chips made by the four planing machines are driven through large pipes, and fall into a trough about 20 inches wide, running across the room immediately under the cutters. In this trough works an endless chain, on which are fixed wooden scrapers that carry along the chips as they fall, to a recess at the side of the room. Here they are carried off by the scrapers of another endless chain running up an inclined plane. The pullies on which this side chain works are larger in dimensions than those of the transverse chain which works inside.

The transverse chain thus deposits its chips in the trough of the inclined plane, and they are carried up to a hole in the ceiling of the fuel room, adjoining the boiler house; through this hole they fall into the fuel room, and fill it up, if necessary, to the top.

28. *Daniel's Planing Machine.*—Where an accurately smooth surface is required, Daniel's planing machine is employed.

It consists of an upright frame, in which a vertical shaft revolves, having horizontal arms, at the ends of which are fixed the cutters.

The work is carried along on a travelling bed under the cutters, which are driven at a very high speed.

29. *Box Making.*—In a box manufactory at Worcester a machine, made on Woodworth's principle, planed boards 10 inches wide simultaneously on both sides.

Boxes are made in great numbers, from boards which are tongued and grooved by what is called a "matching machine," and then put together as that operation is finished.

The tonguing and grooving cutters are fixed on horizontal axes, and the workman passes the boards alternately over one or the other, as the sides require to be tongued or grooved.

Other varieties of planing machines are also in use, known by the names of their different inventors; some of them have fixed vertical or horizontal cutters, others vertical or horizontal revolving cutters, and various other combinations, according to the purposes for which they are intended.

30. *Spill or Match-making Machine.*—This machine makes 900 round spills, 15 inches long, $\frac{1}{8}$ inch diameter, per minute; so that if each spill were cut into 5 matches, each 3 inches long, 4,500 would be produced every minute.

The spills are cut from pieces of straight-grained timber, made of such a length as to pass between two grooved feeding rollers, which hold the timber so that its under surface is level with the lowest parts of a row of tubular cutting tools, or long sharp-edged punches.

The cutting tools are thus arranged: 5 pieces of steel are fixed side by side in a horizontal bar. Each piece of steel is perforated with 3 long holes, lying close together, and having their ends sharpened like the cutting edges of a hollow punch. A line of 15 tubular cutters is thus formed, and motion is given to the horizontal bar, in which they are fixed by a crank which impels them against the timber. This is depressed at each stroke sufficiently to allow each cutter to cut out its spill, which passes through and falls out behind.

The cost of this machine would not exceed 20*l.*, and when the number of matches, all nicely rounded, which it is capable of producing, is contrasted with the number which could be produced by a hand-instrument in the same time, it will serve as a simple and striking illustration of the advantageous employment of matter in the form of machinery to do the work of man.

31. *Last and Boot-tree Manufactory.* — A machine, constructed on Blanchard's principle, is used for making lasts.

A pattern last, and the block of wood from which another last is to be cut, are fixed upon, and revolve round, a common axis, being connected with the centres of a headstock fixed on a frame made to oscillate from below. As the pattern revolves it is kept continually pressed against a knob of iron by a spring, and as the block of wood revolves it is shaped by a circular cutter, revolving on a fixed axis, with its cutting edges in a line with the face of the knob. The pattern and the copy revolving simultaneously on a common axis, as the surface of the pattern is pressed against the projecting knob, the oscillating frame is made to move, so that the revolving cutters shape from the block a surface exactly corresponding to the surface of the pattern, and the copy occupies relatively to the cutters the same position which the pattern does relatively to the knob of iron.

About 18 men are employed, who make 100 pair of lasts per day. exclusive of boot-trees.

32. *Furniture Making.*—Labour-saving machines of all kinds, sawing, planing, boring, shaping, and jointing machines, are very advantageously employed in the manufacture of furniture. An apparatus of a very simple character is used for shaping the arms and legs of chairs.

Two vertical cutters are made to revolve in opposite directions, at the rate of about 1,700 revolutions per minute, on axes projecting above a bench.

The cutters are about 4 inches in diameter, and between them and the bench are loose washers or rollers, against which the pattern to which the work is fastened is pressed so as to guide the cut.

The cutters revolve in opposite directions, and the work may be pressed against either one or the other, so as to suit the cut to the direction of the grain of the wood, without the workman having the trouble of reversing its position.

33. *Agricultural Implements—Ploughs.*—Labour-saving machines are most successfully employed in the manufacture of agricultural implements.

In a plough manufactory at Baltimore eight machines are employed on the various parts of the woodwork.

With these machines seven men are able to make the wooden parts of 30 ploughs per day.

The handle pieces are shaped by a circular cutter, having four blades, similar to those of smoothing planes, fixed on a horizontal axis, with about 2 inches radius, and making nearly 4,000 revolutions per minute. The work to be shaped is fastened to a pattern, which is pressed against a loose roller on the axis of the cutter as the workman passes it along, and it is thus cut of exactly the same shape as the pattern.

All the ploughs of a given size are made to the same model, and their parts, undergoing similar operations, are made all alike. Some of the sharp edges of the wood are taken off or chamferred by a cutter revolving between two cones; these guide and support the work as it is pressed down edgewise on the cutters, and passed along by the workman.

34. *Ploughs*—(*continued*).—The other machines in use consisted of a circular and vertical saw, and machines for jointing, tenoning, drilling, and for making round stave rods, and giving them conical ends, the whole being of a simple and inexpensive character.

The curved handle pieces of the ploughs, which require to be steamed and bent, are obtained already shaped from the forests where they are cut, and are advantageously supplied to the large manufacturers. The prices of the ploughs vary from \$2½ to \$7.

The priceof Pig-iron in Baltimore was	\$40	per ton.
Pine timber - -	\$20	per 1,000 feet.
Ash - - -	\$24	„
Oak - - -	\$25	„

35. *Mowing Machines.*—In a manufactory at Buffalo, mowing machines were being made in large numbers, 1,500 having been supplied this summer. Two were in operation in a field a short distance from the town; each was drawn by 2 horses, and could mow on an average 6 acres of grass per day.

The machine is similar in its construction to the common reaping machine, but it has only one wheel, furnished with projections to prevent it from slipping. This wheel gives motion to the cutters, and supports one side, the other rests on a runner like that of a sledge. It has a pole to which two horses are attached in the ordinary way, and the driver sits on a seat fixed behind the cutters.

36. *Churn Making, &c.*—In an establishment at Worcester, 250 hands are employed principally in making ploughs, hay-cutters, churns, &c.

Templates and labour-saving tools are used in the manufacture of these implements, which are sold in very large numbers.

The churns consist of a double case, the inner one being of zinc, which receives the milk or cream, and in which the arms revolve, the outer one being of wood. It is found by experience that butter is formed; most rapidly when the milk or cream is churned at a certain temperature, and in order to obtain this temperature, which is indicated by a thermometer inserted in the churn, warm or cold water is introduced between the inner zinc and outer wooden casing, as may be required.

37. *Carriage Making.*—Many of the carriages, especially those technically called "waggons," are made of an exceedingly light construction, and are intended generally to carry two and sometimes four persons.

Their wheels are frequently made with only two felloes, which are bent round by the operation of steaming, and are strengthened at the joining with iron clamps. The wheel of a carriage constructed to carry four persons had felloes only 1½ inches square. They are generally made of white oak, and the spokes are obtained ready shaped from shops where their manufacture forms a special trade.

It would seem as if the elasticity of these carriages peculiarly fitted them for the very bad roads on which they in general have to run, and it is evidently a principle with the Americans to use up their light carriages and save their horses.

Every man in America who is able to keep his waggon is free to do so, unfettered and unquestioned, consequently their use is so general that it may be said to be almost universal. Their manufacture is one of great importance, and supports a vast number of wheelwrights and artizans of that class, who from the nature of their employment attain great skill and aptitude, enabling them to turn their hands to almost any variety of work, and rendering them a most useful and important class.

CHAPTER VI.

STONE-PLANING WORKS—BRICK MAKING FROM DRY CLAY.

Staten Island, New York, Washington.

38. *Stone-planing Machines.*—In an establishment at Washington, which has but recently commenced operations, there were two planing machines and a grinding or polishing machine. Considerable difficulties have hitherto attended the employment of machinery for planing stone such as granite, and stone of similar formation.

These difficulties have, however, been surmounted most successfully by the construction of planing machines such as are used in stone works in New York and Washington, in the former of which upwards of 400 men and 10 machines are employed.

The planing machine consists of an upright frame, in which revolves a vertical shaft, carrying 3 horizontal arms. At the extremities of these arms, are fixed circular cutters inclined outwards about 45° from the perpendicular, or about the angle at which the workman would hold his chisel. They are about 10 inches in diameter, and ⅜ inch thick, made of steel, and bevilled on both sides, leaving a sharp edge. They are fitted upon axes, and are at liberty to revolve loosely in their bearings as their edges strike the stone.

The cutters are carried round by the shaft at the rate of about 80 revolutions per minute when planing freestone, and 60 when planing granite.

The stone is moved forward on a bed to which it is keyed; the cutters strike its surface obliquely as they are carried round on the revolving arms, turning at the same time on their own axes, and chipping and breaking off the projecting portions of the stone at every cut.

The machine planed the face of a stone slab, 4 feet long and 2 feet wide, in seven minutes.

Another modification of this machine, which is not so economical, is employed when it is necessary that the face of the stone be left in lines as it came from the tool.

The stone is keyed on a travelling bed, and passed under a frame, in which works a sliding carriage driven by a crank; in this carriage is fixed the circular cutter at the required angle, and as the stone is carried along, the cutter is driven backwards and forwards across its face at right angles to the direction in which it moves, and chips off parallel breadths of stone at every cut.

The cutters can be used for planing from 300 to 400 square feet of freestone surfaces, and about 150 square feet of granite, without being ground.

39. *Stone Polishing Machine.*—The stone is polished by a flat circular disc of soft iron which is made to revolve horizontally. The axis of a disc is fixed at the end of a heavy frame, which moves round a strong centre shaft in a radius of about 12 feet.

The polishing disc revolves at the rate of 180 revolutions per minute. It is driven by a strap to which motion is given by a driving pulley fixed on the centre shaft. The disc is guided, and its pressure regulated by hand. It will polish about 400 square feet of surface in a day of 10 hours.

40. *Brick Making with Dry Clay.*—A machine for making bricks from dry clay was in operation on Staten Island, about nine miles from New York. The works are carried on under extensive sheds, near to the water side, and are

connected with a wharf by a railway, which also extends to the bed from which the clay is dug. A large moveable shed is erected on the bed of clay at the terminus of the railway.

In dry weather the clay is collected by slicing it from the surface with a kind of shovel having a sharp edge, which is drawn by two horses, and will hold about two barrowfuls.

In wet weather the surface of the clay is harrowed to the depth of 2 or 3 inches by a triangular wooden frame carrying 9 teeth, a process which in the powerful rays of an American sun soon causes the moisture to evaporate. It is then taken off by the scoop or shovel above described, and conveyed to the shed, whence it is carried by rail to the machine shed. It is deposited close to a cylindrical screen, revolving on a fixed axis, which has projecting loose bars. The screen is about 8 feet long and 3 feet in diameter, and consists of bars $\frac{5}{8}$ inch square, rivetted on two cast-iron wheels, which form the ends; the bars are about $\frac{1}{16}$ inch apart, and the clay is riddled through them. The screen is inclined, and the clay is fed in between the arms of the wheels, and as it revolves the small pulverized particles fall through the bars, while the large stones pass out at the lowest end.

The clay is next raised by elevators, which are fixed to an endless leather belt about a foot wide, to the height of about 12 feet, and conveyed to rollers. It is ground and shovelled into hoppers which feed the moulds; these are 8 inches long, 4 inches wide, and 4 inches deep.

The clay is dropped into the moulds, which are placed six in a row to the depth of 3 to 3¼ inches, according to the quantity of moisture it contains, and is afterwards compressed to the thickness of 2 inches in the following way.

Six presses or rams, fixed in a heavy frame, are raised by a cam, and being allowed to fall, exert very great pressure by their impact on the clay. The blow is repeated, and then the bricks are powerfully compressed above and below by revolving cams: 36 bricks are made per minute. They are at once conveyed to the kiln, which is under the shed at a short distance from the machine.

After being burnt, they are separated into three shades of colour, of light and deeper reds. The best burnt bricks are equal in quality to the best English stocks, and were selling at $12 per 1000.

41. *Brickmaking from Dry Clay*—(*continued*)—In a brick yard at Washington, Sawyer's machine, which had been in use for 16 years, makes about 1800 bricks per hour from dry clay, by compression only.

The clay is obtained from a pit close by. As it is dug out it is carted up an inclined plane to the floor over the room where the machine is at work.

A roller weighing 1600 lbs., and making 60 revolutions per minute, grinds it upon a grating through which the pulverized particles fall into the room below.

There it is shovelled into a hopper which supplies the brick moulds by feed-pipes. Three bricks are made at one time, being compressed by top and bottom pistons or pressers, which are connected together by long iron rods, and from the top part are suspended levers, with toggle joints worked by cranks. The bricks were sold at the rate of $6½ per 1000, and were of a medium quality between English seconds and stock bricks.

CHAPTER VII.

INDIA RUBBER MANUFACTORY—FISHING-NET MAKING MACHINE—FLOUR MILLS—ELEVATORS.

42. *India Rubber Manufactures.*—India rubber is applied to a great variety of purposes, and its manufacture here is attended with very great success.

By a new process of hardening, the substance becomes of the consistency of horn. In that state it is manufactured into combs, walking sticks, and other articles.

43. *India Rubber Overshoes.*—The India rubber in its rough state is first cut up by shears into small pieces. It is then put through a machine similar to that used for tearing and cleaning rags intended to be made into paper. The water used in the operation is drawn off from time to time through a wire grating.

The material thus chopped up, and cleaned, is passed through rollers, where it is sufficiently ground. It is then put through other rollers, where it is kneaded, and worked up with the necessary composition.

The India rubber, so mixed, is passed in the form of an endless web through 4 rollers placed vertically one above the other, and comes out a broad web fit for use.

The "gumming process" is performed by three rollers, Nos. 1, 2, 3. Nos. 1 and 2, the two lower ones, revolving side by side, and No. 3 revolving above and in contact with No. 2. The India rubber is fed between Nos. 1 and 2, and the cloth to be gummed or covered is passed betwen Nos. 2 and 3, taking up from No. 2 a thin and equally spread coating of rubber.

The India rubber cloth is cut out from the sheet by workmen, in the shape required to form shoes. The parts so shaped are put together by women, who form them on lasts, closing the joints by cohesion after touching them with camphine. Each woman finishes an entire shoe, and about 1400 pairs are made daily.

The shoes are then covered with a coat of varnish, and taken to the stove drying room, where they are subjected to a heat of from 250° to 280°, and allowed to remain a night.

To provide for an equal distribution of heat in the drying room, two large heating stoves are placed underneath, each in a separate compartment. These are fed with fuel from the outside, and the heat is admitted into the drying room above, through several apertures pierced in the floor.

Thermometers are placed at the side of the room, and can be inspected through glass from the outside.

44. *Fishing Net Machines.*—*Baltimore.*—These machines combine the general features of the power loom and the lace machine.

They are made from 6 to 7 feet wide, according to the size of the mesh. One machine nets a ¾-inch mesh, and can be used for netting meshes of 1½ inch and 2¼ inches. It works at the speed of 12 picks per minute, and a complete course of 100 knots is made in the width of this machine, at each pick of the shuttle.

One woman can do the work of upwards of 100 hand netters. The meshes are made rectangular, in the direction of the length of the net, and not diagonally, as in hand-made nets. The cost of the machine is $800 (about £160).

The manufacture of sailcloth is carried on in the mill where these machines are at work.

The throstles for spinning yarn for the sailcloth spin 6 hanks to the pound. The carding engine sliver is carried by the railroad system along a trough to the drawing frame. The main cylinder of the carding engine is 36 inches in diameter, and the doffing cylinder 13 inches, the former making 135 revolutions and the latter 7 revolutions per minute. In the fly-frame the front roller makes 200 revolutions per minute, and the flyer from 1,900 to 2,000.

By some shipowners sailcloth made of cotton is preferred to that made from hemp.

Fishing nets made by hand are here also manufactured of cotton.

45. *Corn and Flour Mills—Pittsburgh.*—These mills employ 40 persons, including clerks and all others engaged in the various departments, and are capable of producing 500 barrels of flour per day, each containing 196lbs.

The grain is brought in bulk in boats alongside the building, and is raised by an elevator consisting of an endless band, to which are fixed a series of metal cans revolving in a long wooden trough, which is lowered through the respective hatchways into the boat, and is connected at its upper end with the building where its belt is driven.

The lower end of the trough is open, and as the endless band revolves, six or eight men shovel the grain into the ascending cans, which raise it so rapidly that 4,000 bushels can be lifted and deposited in the mill in an hour.

The grain is next allowed to descend by a shoot or trough (the descent being regulated by traps) into a large hopper, resting on the platform of a weighing-machine; its weight is then registered, and afterwards, by drawing a trap in the bottom of the hopper, the grain is allowed to descend by another shoot to a lower story.

It is next raised by an elevator to the highest story of the mill, where it is cleaned by passing through three different machines. The greatest care and attention is bestowed on this process, in order to insure the perfect cleansing of the grain preparatory to being ground.

The grain is then conducted to the stock-hoppers, which feed eight pairs of grinding-stones.

A short length of the feeding-pipe of each pair is made of glass, through which the grain, as it descends, can be seen. The stones are 4 feet in diameter, and make 232 revolutions per minute.

The meal, when ground, is conveyed by means of a spiral conveyor to the cooling chamber, where a rake, revolving horizontally, is substituted for the old "hopper boys." The meal is raked from the circumference to the centre, where it falls through a hole and is taken to the bolting machine; it is there sifted, and separated into different qualities of flour. It is then conveyed to hoppers, from which it descends by spouts into the barrels in which it is packed.

46. *Elevators.*—The business of unloading vessels is followed as a special trade.

On the wharves in Buffalo may be seen in many places large signs announcing that elevators are kept for hire.

They are used for raising grain from vessels, storing it in warehouses, and transferring cargoes of wheat from one vessel to another, the grain in the last case being raised by the elevator cans and then allowed to descend by a trough or shoot which guides it in any required direction.

CHAPTER VIII.

MANUFACTURING COMPANIES—CIVIL ENGINEERING—COTTON MILLS—CARPET MANUFACTORY—WOOLLEN AND FELT CLOTH MAKING—SEWING MACHINERY—COTTON GIN.

Lowell, Lawrence, Holyoke, New Haven, Waterbury.

47. *Textile Fabrics.*—The manufacture of textile fabrics is extending, particularly in the New England States.

Many new towns, founded for the purpose of carrying on this branch of manufacture, have in a short time attained considerable importance.

48. Lowell, Lawrence, and Holyoke, in Massachusetts, may be cited as instances well worthy of notice.

Lowell is situated on the banks of the Merrimack, about 25 miles north of Boston. It contains twelve large manufacturing establishments, belonging to different companies; of these, eight manufacture cotton goods, possessing in the aggregate about 350,000 spindles and 10,000 looms, and employing about 7,000 women and 2,000 men.

Two of them manufacture woollen goods, carpets, rugs, and broadcloths (one also combines the manufacture of cotton goods to some extent), possessing about 20,000 spindles and 600 looms, and employing about 1,500 women and 1,000 men.

One is a bleaching concern, employing 250 men.

One a machine shop, employing 700 men.

49. The capital stock of the companies varies in amount from $300,000 (£60,000), to $2,500,000 (£500,000); the total for the whole being $14,000,000 (£2,800,000).

The interiors of the mills are kept in a state of great cleanliness. The rooms are lofty and properly ventilated: their white ceilings and walls, combined with the blue hangers and columns, have a pleasing appearance.

The courtyards of many of the mills are laid out with flower-beds, interspersed with shrubberies, or shaded by lofty trees, and great care seems to be taken to keep them in good order.

50. Water power is used for driving the machinery in all the mills. It is obtained by means of a large and deep canal which is cut from the river at some distance above the town.

At the head of the canal, where it joins the river, are floodgates, worked by large screws, all of which are driven by a small turbine. The masonry of the canal is constructed of blocks of granite, some of which are of very large dimensions.

The water thus conducted by canal is employed by the various companies in driving powerful turbine water-wheels. The mill gearing conveying the power from the turbine to the different parts of the mill, is exceedingly well constructed.

The civil and mechanical engineering works employed in adapting water power to driving the machinery of the Lowell mills, have been most ably executed.

51. The first mills commenced operation in Lowell in 1823. Eight of the companies have been founded since 1830.

In 1828 the town contained 3532 inhabitants: in 1850 its population was 33,385!

It has four banks and two institutions for savings, and a hospital established by the several companies for their sick operatives.

52. *Lawrence.*—Lawrence is situated about 26 miles north of Boston, on the Merrimack river, 9 miles below Lowell.

The first dwelling-house was erected in September 1845, and in 1850 the town contained 8500 inhabitants, and upwards of 1000 dwellings. There were 15 schools, attended by 1000 scholars, and conducted by 16 teachers.

The town now contains upwards of 13,000 inhabitants.

53. *Water Power.*—The water power was obtained by building a dam which has a 25 feet fall of water, 900 feet broad.

The dam is constructed in the form of a curve of solid masonry, imbedded in and bolted to the rock. It is 35 feet thick at the base, and averages 32 feet in height. Its cost was $250,000 (about £50,000).

The water is taken from the river above the dam by a canal just a mile in length, 100 feet broad at its upper end, and 60 feet broad at the lower, 12 feet deep in the middle, and 4 feet at the sides. Its total cost, including locks and other structures connected with it, was $200,000 (about £40,000).

54. *Cotton Mills.*—Seven large incorporated manufacturing companies have already commenced operations, and others are about to be established.

The largest cotton mills employ about 1200 hands.

They have a frontage of 600 feet, and consist of a centre block of six stories 106 feet wide, and two wings of five stories, 64 feet wide.

The machinery is driven by three turbine water-wheels, 8 feet in diameter.

55. *New Cotton Mill.*—Another establishment, lately erected, is now being fitted with machinery for the purpose of manufacturing mousselines de laines, barèges, and other light fabrics.

It is six stories high, each averaging 13 feet, 750 feet long, and 72 feet wide. There is also another building in the course of erection which will be 1200 feet long, two stories high, with two wings, each 200 feet long and three stories high, and is intended to be used for printing, dyeing, &c. These mills are built of good bricks, measuring each 8 inches by 4 inches and 2 inches thick.

The contract price for laying 1000 bricks, including cost of material, is £1 16*s*. The entire erection was found to cost 50 cents (or 2*s*. 1*d*.), per square foot of flooring laid down.

The wool-combing machinery will be obtained from England. One woman working one of these machines, will be able to comb 1,000lbs. of wool per day, while a skilled hand wool-comber is only able to comb from 8 to 10lbs. in the same time.

The machinery of these mills will be driven by turbine water-wheels, of between 500 and 600 horse power in the aggregate.

56. *Woollen Factory.*—The mills of this establishment are built in the form of a parallelogram, round three sides of which run buildings from three to five stories high. The front is formed by three detached mills, each 200 feet by 48 feet, and 9 stories high, including attic and basement.

2,300 hands are employed in the manufacture of cassimeres, shawls, felt cloth, and other woollen goods.

57. *Felt Making.*—The whole waste from the mills mentioned in the preceding paragraph, is worked up in the manufacture of felted cloth.

The felt-making machines occupy but a small space.

A sliver of wool is taken from the carding engine and passed between two endless cloths; these carry it over a narrow steam box, where it is steamed, and it is then passed under a vibrating pressing-plate, which operations cause the fibres to curl and interlace with each other, and so form a cloth.

The machinery of these mills is driven by seven breast wheels, each 26 feet in diameter.

58. *Machine Shop.*—There is a large machine shop employing 500 hands in the manufacture of spinning and other machinery.

It is 4000 feet long, 64 feet broad, and contains four stories of from 16 to 13 feet high. The forge shop is 230 feet long, 53 feet wide, and 17 feet high, and contains 32 forges. The foundry is 150 feet long, 90 feet wide, and 22 feet high.

59. *Holyoke—Cotton Mills.*—Holyoke is a manufacturing town situated on the banks of the Connecticut river.

A short notice of its history will serve to explain the way in which manufacturing companies are established in the United States.

In 1847, a company was formed for the purpose of turning to account the water power supplied by the river Connecticut, buying up the water privileges, and purchasing land to form the site of a manufacturing town.

The company subscribed a capital of $4,000,000, and was incorporated by the State of Massachusetts in 1847.

It succeeded in obtaining the water privileges, and upwards of 11,000 acres of land, besides other tracts in the vicinity. A dam, more than 1,000 feet long, was constructed across the river, in the summer of 1849.

The site of a town has been laid out with streets from 60 to 80 feet wide, calculated for a population of 200,000 inhabitants. It contains already upwards of 5000 inhabitants, and it is officially stated, that the average sum appropriated for the education of each child was in 1852, $3 72c.

There is a 60 feet fall of water, which can be used by two sets of mills on different levels, affording power sufficient to drive the machinery of 100 large mills.

60. *Cotton Mills.*—Two cotton mills employing 1,100 hands, a machine shop employing 365 hands, and a paper mill are already at work; others are in the course of erection.

One of the mills was spinning yarn, Nos. 70 and 90, and making it into cloth of excellent quality.

Self-acting mules were used, and twelve piecers were minding 13,056 spindles: three hanks per spindle were spun in a day of 11½ hours.

One girl is able to weave of this yarn on four looms, 100 yards per day. Upwards of 70 girls were brought from Scotland a short time ago.

The machinery is driven by turbine wheels.

In some mills, gearing is employed for driving the heavy shafting, but generally belts are much preferred; of these, some had a breadth of 20 inches, and were driven at the speed of nearly 1800 yards per minute.

In some cases, in order to obtain sufficient adhesion, without having recourse to too tight a belt, the pulley is covered with leather, which is put on with white lead, and fastened with copper rivets.

61. *Hosiery.*—A large establishment at Waterbury is occupied exclusively in the manufacture of under-vests and drawers. The cloth waistbands of the latter are stitched by sewing machines, working at the rate of 430 stitches per minute. These machines have been worked with entire success for the last eighteen months.

The manufactured goods and the sewing machines are all that are shown to visitors. No stranger is ever permitted to see the hosiery looms; workmen, directors, and president all enter into a bond not to disclose anything connected with the machinery of the company.

62. *Shirt Making by Machinery, New Haven.*—In a shirt manufactory at New Haven, entire shirts, excepting only the gussets, are sewn by sewing machines.

By the aid of these machines one woman can do as much work as from twelve to twenty hand sewers. The workwomen work by the piece, and are frequently able to finish their estimated day's work by two o'clock, and when busy, work overtime.

63. *New Cotton Gin.*—This gin has, instead of saws, a card cylinder 8 or 9 inches in diameter, covered with coarse wire teeth, with considerably more bend or hook than the ordinary card tooth. The cylinder revolves against a spirally fluted cast-iron roller, the tooth being about $\frac{1}{10}$ inch, and the space between the teeth $\frac{3}{10}$ inch broad.

To save the expense of turning and fluting the roller, it is cast in lengths of about six inches, which are bored and turned at the ends, and then put together, the tooth and space being left as they are cast.

In contact with the card cylinder, a cylindrical brush, 28 inches diameter, is made to revolve. The card cylinder makes 200 revolutions, the fluted stripper 400 in a contrary direction, and the cylindrical brush 800 revolutions per minute.

When the raw cotton is introduced with its seeds between the card cylinder and the stripper (which are placed so far apart as to stop the seeds from passing), the hooked teeth of the card take hold of the fibres and pull them from the seed, which is held up against the roller as long as any fibres cling to it for the card teeth to hold by: the seeds are then released, and fall to the ground. The spirally fluted roller causes the position of the seed and cotton to be continually changing.

The cotton fibres, as they are taken round by the teeth of the card cylinder, are brushed off by the rapid revolution of the cylindrical brush, and carried to the bin.

The machine is about 60 inches wide, and can gin 1,500 lbs. of cotton per day. Its cost is $350 (£70).

CHAPTER IX.

RAILWAYS—RAILWAY CARRIAGES—LARGE FOUR-MASTED SHIP—FIRE COMPANIES—FIRE ENGINES.

64. *Railways.*—In the construction of railways, economy and speedy completion are the points which have been specially considered. It is the general opinion that it is better to extend the system of railways as far as possible at once, and be satisfied in the first instance with that quality of construction which present circumstances admit of, rather than to postpone the execution of work so immediately beneficial to the country; to the future is left further progress and improvements.

A single line of rails nailed down to transverse logs, and a train at rare intervals, are deemed to be sufficient as a commencement, and as traffic increases, additional improvements can be made.

65. *Railway Crossings.*—Bridges are seldom thought necessary to carry the common highways across the railroads where they intersect, gates are even in many cases dispensed with, and a notice of "Look out for the locomotive when the bell rings" is considered a sufficient warning, and wayfarers are left to take care of themselves. Sharp curves and steep inclines are frequently submitted to for the sake of economy.

66. *Railroad Inclines.*—The railroad that connects the eastern and western parts of Pennsylvania, bringing the towns on Lake Erie, and the great western rivers into direct communication with Philadelphia and the Atlantic, consists at present of a single line of rails carried over the lofty ridges of the Alleghany Mountains by a series of inclined planes.

These are five in number, and the summit of the highest is 2,600 feet above the level of the sea. The trains are dragged up each incline by a rope attached to a drum worked by a stationary engine.

They are drawn across the plateaux which intervene between the inclines, in some cases by horses, in others by small locomotives. A new road is, however, being constructed which will cross the mountains by one long winding incline. The ascent will be so gradual in its circuitous course, that a locomotive will be able to ascend and descend with its train of carriages.

It is calculated that four hours will be saved by the substitution of this new route, and the dispensing with the stationary engines.

It is doubtful whether the delay would not have been very considerable, had the construction of the railroad been postponed until means had been found for executing these great works in the first instance.

67. *Street Railroads.*—It is a common practice to detach the carriages from the engine at the outskirts of towns, and draw them by horses along rails laid down in the streets.

Many objections may be made to this system, and it seems on the whole disadvantageous; a circuit of rails carried round the town would be more preferable.

68. *Railroad Cars.*—The construction of the railroad cars or carriages commonly used in the United States has been frequently described.

They are very long, and are supported at each end on four-wheeled trucks, on which they swivel when turning the sharp curves, which are of ordinary occurrence.

A car constructed for 60 passengers measured 40 feet long, 8½ feet wide, and 6½ feet high, inside measure; small benches with reversible backs, having each two seats, are ranged parallel to each other down both sides of the carriage, leaving a passage clear from the door at one end to that at the other. The car afforded upwards of 2,200 cubic feet of space, or 37 feet per passenger. Its weight was 11 tons, giving a dead weight of about 3½ cwt. per passenger.

The cost of a 60 passenger car is about $2,000 (400*l.*)

A contrivance has been lately tried for excluding the dust by connecting the different carriages together by india-rubber curtains at the ends, the air being admitted through the roof of the first carriage.

The object sought to be obtained is, a current of air running through the entire train, and always setting outwards from the interior of the carriages. The results did not appear to answer fully the expectation which had been formed.

69. *A Four-masted Clipper Ship.*—A large clipper ship of 4,000 tons was being built at Boston; the length of keel was 287 feet, length on deck 320 feet, extreme breadth of beam 52 feet, and depth of hold 30 feet. Her keel is of rock maple in two thicknesses, the frame is of seasoned white oak, dowelled, and bolted together through the dowelling with 1¼ inch iron. The frame inside is diagonally cross-braced with iron, the braces being 4 inches wide and ¾ inch thick, bolted through every timber: these braces extend from the floor-heads to the top timbers, and form a perfect network of iron over all her frames fore and aft.

She has five depths of mid-ship keelsons, each 16 inches square, three tier of sister keelsons, 15 inches square, bolted vertically and horizontally. There are four tiers of bilge keelsons on each side, 15 inches square. Ceiling from bilge to lower deck 15 inches, scarped and bolted edgewise.

She has three full decks, securely fastened with fore and aft knees; the hanging knees are extra fastened, having in the lower hanging knees 18 bolts, 1¼-inch iron; middle deck, 20 bolts; also upper-deck hanging knees, 20 bolts, and all of oak. Beams in lower deck 14 by 16, in middle deck 15 by 17, in upper deck 12 by 16, and some 12 by 20 inches. Lower deck main hatch is 14 by 20, middle deck 14 by 16, and main deck 14 by 11.

She has a hurricane-deck over all, merely for working the ship, thereby obviating the difficulty in obstructions from houses, spare spars, water casks, &c.

Her main mast is 126 feet long, 98 above deck, diameter 44 inches; masts built of hard pine, to carry two stationary yards with trusses, the same as used on lower yards; fore and main deck alike, and those on the mizen-mast the same as those on the other masts above the lower yards, so that except the courses all her sails will have duplicates on every yard fore and aft. Her main yard is 110 feet long, the others in proportion; she will have a fourth mast, principally to lead the mizen-braces, to prevent the difficulty arising from mizen-braces leading forward, and hauling the mast out of place.

The model of the ship was said to promise a combination of swiftness, buoyancy, and beauty that has never been excelled. Notwithstanding her vast size, such is her length and buoyancy that when loaded ready for sea her draught of water will not exceed 23 feet, a common draught for ships half her size.

70. *Fire Companies.*—The fire companies are formed in many towns of volunteers, who do not receive pay, but enjoy certain immunities from taxes and militia service.

The parade-day of the fire companies of a town is considered as a fête, the companies of other towns are invited to attend, and test the qualities of their respective engines in a trial as to which can throw the highest stream of water. At a meeting of firemen, held in New Haven, 36 companies attended, each dressed in a distinctive uniform, and averaging about 50 strong.

A prize was given to the company whose engine succeeded in throwing the highest stream of water.

The engines played against a pole 150 feet high, through hose 450 feet long. Two engines, one having a 10-inch, the other an 8-inch cylinder, threw a stream 143 feet high, and carried off each a prize. These engines, however, were surpassed the following day by another engine with a 10-inch cylinder, which threw a stream over the pole.

CHAPTER X.

GOVERNMENT WORKS.

New York, Boston, Washington, Springfield.

71. *Navy Yard, New York.*—This navy yard is situated on Long Island, opposite the city. It covers a considerable extent of ground, and has many large storehouses and workshops, and gives employment to between 400 and 500 men.

It contains the most capacious dry dock in the United States, constructed to admit vessels of the largest size.

They may be completely docked, and the water pumped out, in four hours and a quarter. The quantity of water to be removed is about 610,000 cubic feet. It is pumped out by a condensing engine, with a 50-inch cylinder 12 feet stroke, and 32 feet beam.

The cut-off motion is self-adjusting, so that more steam is admitted into the cylinder as the height to which it has to pump the water increases.

The framing of the engine is in the form of Gothic columns, supporting arches, all painted and bronzed. All the work not painted is highly polished.

The whole is surrounded by a bronzed rail, and a cast-iron flooring, ornamented with stars in relief, covers the floor.

The engine-house is about 60 feet square, and 50 feet high. The boilers are placed in a fire-proof room adjoining; they are three in number, 26 feet long, 7 feet in diameter, and are ordinarily used at a pressure of 50 lbs.

The engine works two draining pumps, each 63 inches in diameter, having 8 feet stroke, one being connected to each arm of the beam.

The whole cost of the dock and its appendages is estimated at $2,00,000 (about £400,000).

72. *Navy Yard, Washington.*—In this yard there are from 500 to 600 men in the various departments, employed in the manufacture of ordnance, marine engines, chain cables, anchors, &c.

Experiments were being made with a large gun carrying 240 lbs. shot, and also with a pendulum mortar.

The quality of the metal of which each gun is composed, is tested and registered, and a sample piece preserved.

73. *Boston Navy Yard.*—The Boston Navy Yard is of great extent, and contains three large sheds for ship-building, one of which is now used as a store for timber; another is occupied by the ship "Virginia," which has been on the stocks for more than 20 years; the third is empty. The manufacture of rope is carried on on a very extensive scale. A building 1,360 feet long, contains a rope walk where a length of upwards of 1,200 feet of rope may be made. They have also the means of making 24-inch cables.

A set of machinery is used for making sheaves for ship blocks. An ingenious machine was employed for boring the sheaf, and recessing it on both sides for receiving the bush. Two lathe headstocks are mounted on a frame, and carry the small revolving cutters for making the recesses. An universal concentric chuck with three "jaws," having a large hole in its centre, is mounted between the headstocks. This [illegible] the work, and has a vertical adjustment.

74. *Springfield Armoury.*—Springfield Armoury is beautifully situated on an eminence overlooking the town. The various buildings together form a quadrangle; the grounds, which are tastefully laid out, occupy an extent of about 40 acres.

I was conducted over the establishment by the Commanding Officer, Colonel Ripley, and the master machinist, Mr. Buckland, who is the inventor of the principal machines employed in the manufacture of fire arms.

The front building, which has a handsome centre tower, is used as an arsenal for muskets. It contains 100,000 muskets, stacked with beautiful uniformity.

The barrels are made in mills, situated on the banks of a small river at some distance. The lighter parts of the musket, as the stock, the lock, guards, &c., are manufactured in the workshops attached to the Armoury.

The machines employed in the manufacture of the musket stocks are worthy of particular notice. By the kind courtesy of Colonel Ripley, facilities were afforded me for observing the time occupied in each operation.

The stocks are purchased rough from the saw for 28 cents (or 1*s.* 2*d.*) each.

	Time occupied.	
	Min.	Sec.
1. They are roughly turned in Blanchard's machine, which has been in operation nearly 30 years	4	11
2. While one stock is being turned, the attendant is able to face and slab another by a circular saw	3	30
3. The stock is next taken to what is called a "spotting" machine, where the sides are cut flat in different parts, to serve as bearings, or points to work from in future processes; this is done by 2 pairs of horizontal cutters, one pair at each end, and 3 single cutters in the centre	0	7
4. Next to a "barrel-bedding" machine, where a groove is cut for the barrel; this is done by 4 bits set with their guides in a row, in a sliding frame combined with a horizontal cutter, with a vibratory motion given by hand for shaping the groove conically, and a vertical bit for recessing	1	7½
The next operation, that of finishing the groove by chisel, is performed by hand in 1 min. 42 sec. .. .. .. 1 min. 42 sec.		
5. The stock is then sawn to the required length	0	11½
6. A "bed" is next recessed for the side plate, the sides of the stock are flattened by 2 vertical cutters, and the bed is recessed by a horizontal bit ..	1	11¾
7. The edges of the stock are then faced by a horizontal cutter	0	14
8. The stock is next taken to a butt-plate machine, where a bed is recessed and screw-holes made for the butt-plate by a horizontal bit and screw, and also a vertical bit and screw	0	21½
9. Next to a "band-fitting" machine, where 3 horizontal cutters cut 3 straight bands, and a fourth bevils the upper or bayonet band	0	22¾
10. Next to a "band-finishing" machine, where 4 horizontal cutters round off the parts intervening between the bands	0	28½
11. The stock is then turned a second time, in order to smooth its surface, 1st from the butt to the breech tang	8	35
12. 2nd, from the breech tang to the end of the stock	5	28
13. It is next taken to the "lock-bedding" machine, where the bed for the lock is recessed and shaped by 5 vertical bits set with their guides in a circular frame, at equal distances from each other. The driving-strap is made to run on a loose pulley fixed above the circular frame, and as each bit is brought into operation the band drops from the loose pulley on the driving pulley of the bit which is brought underneath it, and is raised, when the operation is finished, to its former position, ready to descend on the pulley of the next bit. The cuttings are blown away by 2 fan-pipes	0	46¾
14. Next to the "guard-bedding" machine, it was similar in its construction to the former, but it carried 4 bits instead of 5, and recessed and shaped the bed for the guard	0	51
15. The holes for the side screws were then bored	0	15
then for the tang screw	0	8¾
16. The stock was lastly taken to the "band, spring, and ramrod-fitting" machine. A vertical revolving cutter grooved recesses for the band-springs, a horizontal cutter recessed the groove for the barrel	0	55¼
A hand operation then finished off the whole. Time, 35 seconds .. .. 35 sec.		
Total time of machine operations	28	45¼
Ditto hand ditto	2	17
	31	2¼
Allowance for double simultaneous operations during turning	8	58
Man's time given to the whole operations of making a complete musket-stock ..	22	4¼

ging abou

The complete musket is made (by putting together the separate parts) in 3 minutes. All these parts are so exactly alike that any single part will, in in its place, fit any musket.

The general principle adopted in the construction of these machines is that of guiding the cutter in its course, by a shaper or "former," that is, a pattern made exactly of the form in which it is required that the work should be shaped.

The number of muskets made in the year 1852 amounted to 19,800.

75. *Coast Survey Office, Washington.*—Workshops are attached to the Coast Survey Office, where copies of the standard weights and measures of the United States are made. The office supplies the capital of every State in the Union, in addition to the standard weights and measures, with three very accurate balances.

No. 1 is constructed to weigh from 50lbs. down to 10lbs.
No. 2 to weigh from 10lbs. to 1lb.
No. 3 to weigh from 1lb. to $\frac{1}{10,000}$ oz.

The estimated cost of the three is $4,600, about 900*l.* The latter balance was tested, and deflected by the $\frac{1}{10,000}$ oz. In weighing 1lb., the effect of the addition of $\frac{1}{200}$ grain was instantly visible.

When the balance is not in use, the beam is made to descend by means of a screw, so that two external cones, placed on its under side, rest in two internal cones fixed on the supporting frame. Two steel discs attached to the chains of the scales are, by the same screw, made to descend, and rest upon the frame. Thus the whole balance is supported, and there is no continued strain on the knife edges.

A lever worked by hand acts upon the two short vertical rods placed under the scales, and adjusts them evenly before commencing the operation of weighing.

The balance stands on four feet, each adjustable by screws.

The full set of standard weights and measures supplied by the office consists of—

1. A set of standard weights from 1lb. to 50lbs. avordupois; and 1lb. troy.
2. From 1oz. down to $\frac{1}{10,000}$ oz. troy.
3. A yard measure.
4. Liquid measures. The gallon and its parts down to half-pint inclusive.
5. A half-bushel measure.

Twenty-one States have been supplied, and other sets are being prepared for the remaining States. There are 13 workmen employed.

The United States standard yard has been obtained from a 7 feet standard procured from England.

It is made of gun-metal, about 2 inches broad and $\frac{3}{8}$ inch thick, and has a thin strip of silver, $\frac{1}{5}$ inch broad, let into it through its entire length. It is divided into small divisions, each being an aliquot part of an inch. The standard was obtained by taking the mean of a great number of measurements made from different points in the 7 feet scale.

A set of standards has been presented to France, and a set of French standards was presented to the United States in return.

It is a matter of surprise that while the people of the United States have long felt and appreciated the benefits of their decimal monetary system, the old English system of weights and measures has not yet been abolished by the Legislature. Its inconveniences are much complained of, and custom has tried to remedy its evident defects to a great extent by adopting the plan of reckoning by 100lbs. (instead of the cwt. or 112 lbs.) and by 1000lbs.

Monetary accounts are kept, and calculations are made with the greatest facility in dollars and cents, the dollar (4*s.* 2*d.*) being divided into 100 cents (a cent ½*d*). Convenient coins called "dimes" are in circulation, 10 cents being equal to one dime, and 10 dimes making a dollar. Quarter dollar and half dollar pieces are also commonly used; there appears to be no reason why a decimal system would not afford equal advantages, if applied, as it doubtless will be eventually, to the scales of weights and measures.

The Coast Survey Office has custody of two instruments used in measuring by means of end measurements. A base line 7 miles long, was measured on an island near Charleston, in about six weeks. The measuring instruments were supported on two adjustable stands.

They were made on the compensating principle, and inclosed in a double case of tin, to prevent, as much as possible, their being affected by changes of temperature. The ends of the instruments were of agate, one flat, the other having a knife edge. The latter was made to slide, and was connected by a bell-crank lever to a spirit level, which indicated when the end measures were in contact, according to the method employed by Bessel, in making standard measures in Prussia.

CHAPTER XI.

ELECTRIC TELEGRAPHS.

76. The advantages to be derived from the adoption of the Electric Telegraph, have in no country been more promptly appreciated than in the United States. A system of communication that annihilates distance, was felt to be of vital importance, both politically and commercially, in a country so vast, and having a populaation so widely scattered. It met accordingly with great encouragement, both from the federal Government at Washington and from the local Governments of the various States.

Distances are now to be measured by intervals, not of space, but of time: to bring Boston, New York, and Philadelphia into instantaneous communication with New Orleans and St. Louis—to centralize in Washington, at any given moment, information gathered simultaneously from the far corners of the thirty-one provinces of the Union, is to extend throughout the confederacy bonds of the most intimate connexion.

In the operations of commerce, the great capitals of the North, South, and West are moved, as it were, by a common intelligence; information respecting the state of the various markets is readily obtained, the results of consignments may be calculated almost with certainty, and sudden fluctuations in price in a great measure provided against.

If, on the arrival of an European mail at one of the northern ports, the news from Europe report that the supply of cotton or of corn is inadequate to meet the existing demand, almost before the vessel can be moored intelligence is spread by the Electric Telegraph, and the merchants and shippers of New Orleans are busied in the preparation of freights, or the corn-factors of St. Louis and Chicago, in the far west, are emptying their granaries and forwarding their contents by rail or by canal to the Atlantic ports.

There may be, no doubt, similar general advantages derived everywhere from the introduction of the Electric Telegraph, but they are such as affect with peculiar benefit a country like the United States, consisting of confederated provinces, differing one from another in climate, in productions, in laws, and institutions, and in some cases in the character of their inhabitants.

77. The introduction of so important a system was not left to the unaided exertions of private enterprise. In 1844, Congress made a liberal grant in order to put in operation the first telegraph line that was erected in the States —that between Washington and Baltimore—and before seven years had elapsed the Committee on Post Offices and Post Roads presented to the Senate, in 1851, their report on the route which they had selected for a gigantic telegraph line, nearly 2,500 miles in length, connecting San Francisco with Natchez on the Mississippi, and thence with the vast network of lines that already covered the Atlantic States. Such was the rapid development of this system of communication, supported by the federal Government, and fostered by that of individual States, which passed general laws authorising the immediate construction of

telegraph lines, wherever they would be conducive to the interest of the public, and affording every facility to the formation of companies for that purpose.

If a company, or even a private individual, should propose to construct a telegraph line, and can show that it would be beneficial to the public (and as to this proof there is generally but very little difficulty), he may obtain an Act authorising him to proceed, as a matter of course; no private interests can oppose the passage of the line through any property; there are no committees, no counsel, no long array of witnesses and expensive hearings; compensation is made simply for damage done, the amount being assessed by a jury, and generally on a most moderate estimate. With a celerity that is surprising a company is incorporated, the line is built, and operations are commenced. Similar facilities are also afforded in many of the States, by general laws authorising the construction of railroads.

78. There are in the United States between 20 and 30 joint-stock electric telegraph companies, and an endeavour is now being made to amalgamate them into one company. The systems generally in use are those of Morse, Bain, and House.

The conflicting claims of these three systems have formed the subject of protracted litigation, and, without going into minute details, it may be sufficient to mention the distinctive features of each.

Professor Morse employs receiving magnets which close local circuits attached to each telegraph office, and so charge another magnet called the register magnet; this acts upon an armature attached to a lever which presses down a metallic point upon a cylindrical roller, a strip of paper is passed at an uniform rate between the metal point and the roller, and by the indentation of lines and dots, representing letters of the alphabet, the message transmitted is registered at the rate of about 20 words per minute.

It has been also found practicable to receive and understand messages by merely listening to the click of the armature, and the attendant writes down the words of the message, trusting solely to his ear for interpreting them correctly.

The cost of a Morse Register is about $40, £8.

The system patented by Mr. Bain is called the Electro-chemical Telegraph.

He employs a metal disc, carrying a prepared sheet of paper, on which lines and dots are marked by the decomposition of a metallic point, acted upon by an electric current.

The metal disc revolves at an uniform rate by the agency of clock-work, and the point or pen is made to move over the paper laid on the disc in the direction of a spiral.

No receiving magnet is necessary, and a comparatively weak current of electricity, traversing long wires, leaves instantaneously a mark upon the prepared paper.

The system is capable of being so modified as to transmit messages with great rapidity. Spaces representing alphabetic lines and dots are punched out from a long strip of paper, called the message-strip; this is passed rapidly between a cylinder and a toothed lever connected respectively with the electrodes of a battery; when the tooth of the lever falls in the spaces punched in the strip, it will be in connection with the cylinder, and close the circuit; when the paper (which, being dry, is a non-conductor) intervenes, the circuit will be broken. When the circuit is closed, the pen fixed at the other end of the wire will mark on the paper lines and dots exactly corresponding to those punched out of the message-strip.

In Mr. House's system the message is printed by the telegraph instrument itself. The electric current is made to act by rapid pulsations on an "axial magnet" that opens and closes a valve connected with a pneumatic printing-machine.

The machine, which is ably contrived, is worked by manual power, and prints messages at the rate of about 20 words per minute; its cost is about $250 (£50).

Grove's batteries are generally used in all the systems.

79. The aggregate length of the telegraph lines in the United States exceeded, in 1852, 15,000 miles, of which—

12,124	were worked on the system of	Morse.
1,199	. . .	Bain.
1,358	. . .	House.

These numbers have been considerably increased this year, and many amalgamations of the different companies working under Morse's and Bain's patents have been made.

In November, 1852, eleven different companies had offices in New York.

Extracts from the annual reports of two companies, one whose line extends from New York to Washington, in competition with a rival line; the other, a western company, whose line connects Pittsburg with Louisville, will serve to give an idea of the amount of business carried on.

80. *New York and Washington Line.*—Messages are charged at the rate of 50 cents (2*s.* 1*d.*) for 10 words, and 5 cents (2½*d.*) for every additional word, for transmission from New York to Washington, a distance of 270 miles.

				Messages.		Receipts.
In the month of	July,	1851,	there were sent	13,463,	producing	$4,991 62, about £1,000
„ „	January,	1852,	„	23,962,	„	$11,352 97, about £2,230
„ „	June,	1852.	„	25,298,	„	$11,832 03, about £2,360
Total for year ending June, 1852			..	253,857,	„	$103,232 37, about £20,000

The capital of the company is $370,000 (about £70,000); it has 7 wires from New York to Philadelphia, 6 from Philadelphia to Washington, connecting together 13 stations.

The number of persons employed on this line, including the staff of clerks and out-door surveyors and messengers, amounts to 125.

It should, however, be borne in mind that the distances through which messages have to be transmitted in America are so great that a slight delay in time is not of that immediate importance which it is in our own country; especially when it is considered that in England the great proportion of business is crowded into the "office hours" of the day, while in America it is spread over the entire 24 hours.

The average cost of constructing the line is estimated at $185 per mile.

7. *Pittsburgh and Louisville Telegraph Line:*—

Length of line, 450 miles.
Words transmitted in 1850, 3,602,760.
Total receipts .. $73,278,
about £14,500.

81. The most distant points connected by electric telegraph in North America are Quebec and New Orleans, which are 3,000 miles apart, and the network of lines extends to the west as far as Missouri, about 500 towns and villages being provided with stations.

There are two separate lines connecting New York with New Orleans, one running along the sea-board, the other by way of the Mississipi, each about 2,000 miles long. Messages have been transmitted from New York to New Orleans, and answers received, in the space of three hours, though they had necessarily to be written several times in the course of transmission.

When the contemplated lines connecting California with the Atlantic, and Newfoundland with the main continent, are completed, San Francisco will be in communication with St. John's, Newfoundland, which is distant from Galway but five days' passage. It is, therefore, estimated that intelligence may be conveyed from the Pacific to Europe, and *vice versa*, in about six days.

82. The cost of erecting telegraph lines varies according to localities, but the expenses upon the whole are estimated to average about $180 (about £35) per mile throughout the States; the moderate amount of this estimate is, in a great measure, to be attributed to the facilities afforded by the general telegraph laws for the formation of companies and the construction of lines.

The electric telegraph is used by all classes of society as an ordinary method of transmitting intelligence.

Government despatches and messages, involving the life or death of any persons, are entitled to precedence, next come important press communications, but the latter, if not of extraordinary interest, await their regular turn.

The leading newspapers of New York contribute jointly towards the expenses of daily telegraphic communications. The annual sum paid by the "Associated Press" averages $30,000 per annum.

The following is the tariff for the press despatches:—

	Under		200	miles,	1	cent	per word.
Between	200	and	500	„	2	„	„
„	500	„	700	„	3	„	„
„	700	„	1,000	„	4	„	„
„	1,000	„	1,500	„	5	„	„
„	1,500	„	over	„	6	„	„

Assuming 3 cents as the mean average, the total amount of matter received by telegraph for the "New York Associated Press" amounts to a million words per annum, or about 600 columns of a London newspaper of the largest size, averaging about two columns per day.

Supposing six papers to be associated together, the share of each would annually amount to about $5,000, or £1,000, for two columns of telegraphic intelligence daily.

Commercial men use the electric telegraph in their transactions to a very great extent. In 1852 there were transmitted by one of the three telegraph lines that connect New York and Boston between 500 and 600 messages daily. The sums paid on this line by some of the principal commercial houses who used it averaged in 1852 for each from $60 (£12) to $80 (about £16) per month.

On other lines the leading commercial houses were estimated to pay from $500 to $1,000 (£100 to £200) per annum for telegraphic despatches.

83. Interruptions occur most frequently from the interference of atmospheric electricity; in summer they are estimated to take place on an average twice a week, but many contrivances have been adopted for obviating this inconvenience, such as lightning arrestors, &c., which are generally known; the number of interruptions have been thereby reduced about 30 per cent.

Other accidental causes of interruption occur irregularly from the falling of the poles, the breaking of the wires by falling trees, and, particularly in winter, from the accumulated weight of snow or ice.

The electric current is made to act through long distances, by using local and branch circuits, and relay magnets, in those systems where it would be otherwise too weak to operate effectually.

In Mr. Bain's system, a weak current is found sufficient for very long distances; between New York and Boston, a distance of 270 miles, no branch or local circuit is required. In some cases, where both Morse's and Bain's telegraphs are used by an amalgamated company in the same office, it is found convenient, in certain conditions of the atmosphere, to remove the wires from Morse's instruments, and connect them with Bain's, on which it is practicable to operate when communication by Morse's system is interrupted.

It is generally believed that by laying insulated wires underground the interruptions will be reduced so as to be altogether inconsiderable. The expense of the process, however, is regarded as a great impediment in the United States, where cheapness of construction is an object of the highest consideration.

84. The application of the electric telegraph is not confined to the transmission of messages from one part of the States to another: in the form of a local or municipal telegraph, it is employed as an important instrument of regulation and intelligence in the internal administration of towns.

No adaptation of the system can be more interesting and useful than that which is made for the purpose of conveying signals of alarm and intelligence in the case of fire.

This system has been very completely developed in Boston.

The city is divided into seven districts, each provided with a powerful alarm bell. Every district contains several stations, varying in number according to its size and population. There are altogether in the seven districts 42 stations. All these stations are connected with a chief central office, to which intelligence of fire is conveyed, and from which the alarm is given; two telegraph wires are employed, a return wire being used to complete the circuit, and provide as completely as possible against accidental interruption or confusion.

At each of the 42 stations, which are placed at intervals of 100 rods throughout the city, there is erected in some conspicuous position a cast-iron box containing the apparatus for conveying intelligence to the central office. The box is kept locked, but the key is always to be found in the custody of some person in the neighbourhood, whose address is painted on the box door.

On opening this door, access is gained to a handle which is directed, by a notice painted above it, to be turned slowly several times. The handle turns a wheel that carries a certain number of teeth, arranged in two groups, the number of teeth in one representing the district, in the other, the station; these teeth act upon a signal key, closing and breaking the circuit connected with the central office as many times as there are teeth in the wheel. Signals are thus conveyed to the central office, and, by striking the signal bell a certain number of times, the district and station from which the signal is made is indicated.

An attendant is always on the watch at the central office, and on his attention being called to the signals by the striking of a large call bell, he immediately sets in motion his alarm apparatus, and by depressing his telegraph-key, causes all the alarm bells of the seven districts to toll as many times in quick succession as will indicate the district where the fire has occurred, the alarm being repeated at short intervals for as long a time as may be necessary.

The signal-boxes erected at the stations contain, in addition to the signal-handle, a small electro-magnet, an armature, and a signal-key, so that full and particular communications can be made between each box and the central station, the clicks of the armature forming audible signals. They have also an apparatus called a "Discharger of Atmospheric Electricity," for preventing the occurrence of injuries during thunderstorms.

By this system certain information is given to the central office at the earliest possible moment of the exact locality in which a fire may have broken out, and the alarm is immediately spread over the entire city.

Every one who is aroused by the alarm is enabled to tell at once whether interest or duty calls him to the scene of action, and the exact point to which assistance is summoned. Should the alarm be given in the night, those whose attention is awakened may ascertain from the tolling of the bell the precise quarter in which danger threatens, and should they have been needlessly disturbed, may rest in peace, and find in the knowledge that they aud theirs at least are in safety, a consolation for broken slumbers.

85 Telegraph wires in towns are almost universally carried along the tops of houses, or on poles erected in the streets, instead of being conveyed in pipes underground. So little difficulty is met with on the part of proprietors of houses, that telegraph lines are in some cases erected by private individuals for their own particular use. As an instance, may be mentioned the case of a large manufacturer in New York, who has an office in one part of the city, while his works lie in a contrary direction. In order to keep up a direct communication between both, he has erected a telegraphic wire at his own expense, and carried it over the tops of the houses intervening between his office and his works, having obtained without any trouble the permission of their various owners.

86. It has been already stated that the number of miles of telegraph lines erected in the United States exceeded, in 1852, 15,000; and it may be useful, in conclusion, to give a list of them, and the number of wires they had each in operation.

MORSE LINES.	No. of Wires.	Length in Miles.
1. New York to Boston, *viâ* Springfield	3	250
2. New York to Buffalo, *viâ* Troy	3	513
3. New York to Dundirk	1	440
4. New York and Erie Railroad Telegraph	1	460
5. New York to Washington, *viâ* Baltimore	7	260
6. New York to New Orleans (sea-board)	1	1,966
7. Boston to Portland, *viâ* Dover	2	100
8. Philadelphia to Lewiston, Del.	1	12
9. Philadelphia to Pittsburgh, *viâ* Harrisburg	1	309
10. Philadelphia to Pottsville, *viâ* Reading	1	98
11. Baltimore, *viâ* Wheeling, to Cumberland	1	324
12. Baltimore to Harrisburg, *viâ* York, PA.	1	72
13. Washington to New Orleans, *viâ* Richmond, PA. ..	1	1,716
14. Harpers Ferry to Winchester, PA.	1	32
15. York to Lancaster, *viâ* Columbia, PA.	1	22
16. Reading to Harrisburg	1	51
17. Pittsburg to Cincinnati, *viâ* Columbia	1	310
18. Cincinnati to St. Louis, *viâ* Vincennes	1	410
19. Cincinnati to Maysville, Ky., *viâ* Ripley	1	60
20. Columbia to New Orleans, *viâ* Natchez	1	638
21. Cincinnati to St. Louis, *viâ* Indianopolis	1	400
22. Cincinnati to Sandusky	1	218
23. Cincinnati to Dayton and Chicago (Ohio wire) ..	1	100
24. St. Louis to Chicago, *viâ* Alton, I. M.	1	330
25. St. Louis to Independence, Mobile	1	25
26. Alton to Galena, *viâ* Quincey	1	380
27. New Orleans to Balize	1	90
28. Cleveland to Cincinnati	2	125
29. Cleveland to Pittsburgh	1	150
30. Cleveland to Zanesville	1	150
31. Zanesville to Newark	1	40
32. Toledo to Terra Haute, *viâ* Fort Mayne	1	300
33. Sandusky to Mansfield	1	40
34. Columbus to Portsmouth, O.	1	90
35. Columbus to Lancaster, O.	1	25
36. Lancaster to Logans Port	1	15
37. Milwaukie to Green Bay	1	200
38. Milwaukie to Galena, *viâ* Madesa	1	250
36. Banesville to Marietta	1	66
40. Buffalo to Milwaukie, *viâ* Cleveland and Chicago ..	2	400
41. Buffalo to Queenston, Canada, *viâ* Lockport	1	48
42. Buffalo to Detroit, *viâ* Cleveland	1	400
43. Syracuse to Oswego, N. Y.	1	40
44. Troy to Montreal, *viâ* Burlington	1	278
45. Portland to Calais (Maine)	1	350
46. Calais to Halifax, *viâ* St. John's	1	400
47. Worcester to New Bedford, *viâ* Providence	1	97
48. Worcester to New London, *viâ* Norwich	1	74
Total	61	13,124
BAIN LINES (some of these are now amalgamated with the Morse Lines).		
1. New York to Boston (Merchants)	2	250
2. New York to Buffalo	2	513
3. Boston to Portland	1	100
4. Boston, *viâ* Burlington, to Ogdensburgh	1	350
5. Troy to Saratoga	1	36
Total	7	1,249
HOUSE LINES, belonging to one Company.		
1. New York to Washington	2	260
2. New York to Boston	2	250
3. New York to Buffalo	3	513
4. Buffalo to Cincinnati	1	325
Total	7	1,348

These lines are being rapidly extended. It is intended to connect Cincinnati with Louisville and St. Louis.

CANADIAN LINES.	No. of Wires.	Length in Miles.
1. Quebec to Suspension Bridge, Niagara		155
2. Quebec to New Brunswick Frontier		220
3. Montreal to No. 7 State Line, Highgate		47
4. Montreal to Bytown		115
5. Hamilton to Port Sarina, on L. Huron		143
6. Niagara to Chippewa		14
7. Brantford to Simcoe		33
8. Kingston to Hamilton		256
Canadian Lines		983
Morse do.		13,124
Bain do.		1,249
House do.		1,348
Total Lines in North America		16,704

CHAPTER XII.

THE PATENT SYSTEM.

87. The patent system of the United States is based upon the first Article of the Constitution, which says:—

"The Congress shall have power to promote the progress of science and the useful arts by securing, for limited times, to authors and inventors the exclusive right to their respective writings and discoveries."

Letters patent, securing this exclusive right, and extending to all the States of the Union, are granted by the federal Government. The Patent Office, from which they issue, is attached to the department of State, and its chief officer, "called the Commissioner of Patents, is appointed by the President, by and with the advice of the Senate."

All patents are issued in the name of the United States, signed by the Secretary of State, and countersigned by the Commissioner of Patents.

"All actions or suits, arising under any law granting or confirming to inventors the exclusive right to their inventions or discoveries, are originally cognizable by the Circuit Courts, and an appeal lies to the Supreme Court of the United States."

The Patent Office is conspicuous among the public buildings of Washington for the beauty of its architecture; it is built of white marble, and modelled after the Parthenon at Athens. When completed, it will be quadrangular, having a frontage of 413 feet, with a depth of 280 feet, and inclosing an open court, having an area of 270 feet by 112 feet. The principal entrance leads into a hall, round which are ranged glazed cases, containing models of inventions. From the right of the hall branches off a passage, on each side of which lie the various offices of the commissioner, examiners, and clerks, and the library. On the left are three large rooms, appropriated to the reception of models of all the inventions patented in the United States. At the extreme end of the hall is a double staircase leading to the superior apartments, one of which is used as a museum.

The various departments have each their respective offices; in some the applications for letters patent are received, in others the alleged inventions are examined (each examiner taking some particular subject), in others the drawings and specifications are preserved in portfolios, which slide on rollers in deep cases. There is also an extensive library, to which large additions are being continually made, for official use, and the convenience of applicants for patents.

The model-rooms contain upwards of 23,000 models, arranged in large glass cases, but there is no catalogue to assist or guide those who search for any particular model that may be required for inspection.

It not unfrequently happens that the subject of a patent undergoes considerable modification in the case of "additional improvements" being added, or when the letters-patent are "re-issued," so that the model in such a case does not eventually represent the invention for which the patent is virtually granted, and is therefore useless. If, however, the models were to be so classified that those which are valuable were separated from those which are worthless, and arranged in appropriate and distinctive series, they would then exhibit, step by step, the progress which had been made in the particular art or manufacture to which they belong, and with the aid of a well-digested catalogue they would be of great national utility... But an assemblage which comprehends indiscriminately models of every patented invention must, sooner or later, become so large that confusion only can result, and all practical purposes of utility must be defeated.

The models of the inventions for which patents have been refused are kept in the basement vaults, and it is doubtful if they serve any purpose sufficiently useful to repay the trouble of preserving them.

88. The Official Staff of the Patent Office is at present composed of—

The Commissioner,	receiving	$3,000	per annum.
The Chief Clerk	"	2,000	"
Six Examiners	"	2,500	"
One Assistant, Class IV.	"	1,800	"
Twelve do., Class III.	"	1,500	"
Seven do., Class II.	"	1,200	"
Librarian	"	1,200	"
Machinist	"	1,250	"
Agricultural Clerk	"	1,500	"

Twenty temporary Clerks at a variable salary.

The total amount of official salaries was, in 1852, $56,064 (about £11,200).

The amount of business transacted in the office in 1852 will appear from the following statement:—

Applications for patents pending January 1852	155
Applications received during 1852	2,639
Patents issued	1,020
Rejections and suspensions	1,293
Applications undecided	481

Among the patents issued are reckoned—

Re-issues	18
Additional improvements	4
Extensions	3
Designs	107

There were also filed—

Caveats	996
Disclaimers	2
Patents expired	525

In order to convey a general idea of the different classes of invention for which the patents were granted, and the number in each class during the year 1852, they will be given in the classified form adopted in the Patent Office.

Class	1.	Agricultural implements	114
"	2.	Metallurgy manufacture of metals, and instruments therefor	125
"	3.	Textile manufactures and machines for preparing fibrous substances	69
"	4.	Chemical process manufactures and compounds, including medicines, dyeing, colour-making, distilling, soap and candle-making, mortars, cements, &c.	50
"	5.	Calorifics, comprising lamps, fireplaces, furnaces, stoves, preparations of fuel, &c.	50
"	6.	Steam and gas-engines, boilers and furnaces	36
"	7.	Navigation and maritime implements, vessels, diving apparatus, life-preservers, &c.	23
"	8.	Mathematical, philosophical, and optical instruments, clocks, &c.	27

Class 9.	Civil engineering and architecture, and apparatus employed on railroads, bridges, waterworks, &c.	32
„ 10.	Land conveyances, roads, vehicles, wheels, &c.	72
„ 11.	Hydraulics and pneumatics, water-wheels, wind-mills, apparatus for raising or delivering fluids	16
„ 12.	Lever screw, and mechanical power applied to pressing, weighing, raising and moving weights	12
„ 13.	Grinding-mills, gearing, grain-mills, and mechanical movements and horse powers	41
„ 14.	Lumber-machines for dressing wood	44
„ 15.	Stone and clay manufactures, pottery, glass, bricks, stone-dressing, cements, &c.	29
„ 16.	Leather-dressing and manufactures, boots, harness, &c. ..	26
„ 17.	Household furniture, domestic implements, feather-dressing mattresses	43
„ 18.	Fine arts, music, painting, sculpture, engraving, books, paper, printing, binding, jewellery	48
„ 19.	Fire-arms, implements, and munitions of war	7
„ 20.	Surgical and medical instruments, trusses, bathing apparatus, &c.	13
„ 21.	Wearing apparel, toilet articles, and instruments for manufacturing them	16
„ 22.	Miscellaneous	20
		913
	Designs, &c.	107
	Patents issued	1,020

89. *Persons entitled to Apply for Letters Patent.*—An original inventor only is entitled to apply for a patent; the mere introducer of an invention has no claim whatever.

Every applicant is required to make oath "that he verily believes himself to be the true and first inventor," and whenever it appears that the inventor did so believe at the time of his application, the subsequent discovery that the invention had been used abroad will not invalidate his patent, provided it does not appear that the invention had been patented, or described in a printed publication.

If the inventor shall have assigned his entire interest previous to the application, and the assignment has been recorded in the Patent Office according to law, the patent will be issued to the assignee, but the inventor must still sign the application.

Upon the decease of an inventor, his legal representatives may (on the same conditions on which the inventor, if living, would stand) obtain a patent for the benefit of his heirs or devisees, even though the inventor had not during his lifetime taken any steps towards securing a grant.

Foreigners who have resided for one year previous to their application, and have made oath of their intention to become naturalised, have all the privileges of citizens.

90. *Subject-matter of Letters Patent.*—It has been said that a patent is only granted for a *bonâ fide* invention, and not for a mere introduction.

In other respects there is not much difference between the law of England and that of the United States.

It should be remarked, however, that all applications for grants are rejected in which the examiners of the Patent Office believe that they can discover any "double use," that is, an application of an old contrivance to a new purpose: so rigidly is this rule followed out, that in some instances patents have been refused for inventions confessedly valuable, and producing new manufactures, because in totally different branches of manufacture inventions somewhat similar had been already patented.

The law of the United States holds as good subject-matter for a grant:—

"Any new or useful art, machine, manufacture or composition of matter, or any new and useful improvement on any art, machine, manufacture, or composition of matter."

With regard to prior use, an inventor has very extensive privileges in the United States.

He may, during the period of two years, publicly use, and even sell his invention, without invalidating a patent obtained at the end of that time; but a public use for a longer time is considered as an abandonment of his discovery to the public.

A prior discovery will not invalidate a subsequent patent if it can be shown that it was laid aside without being perfected or reduced to practice.

A discovery that has once been abandoned to the public, by being used, unprotected, for more than two years, or otherwise, cannot be subsequently reclaimed.

A patent will be granted for an invention patented in a foreign country at any time within six months of the date of the foreign patent, or afterwards if it can be shown that the foreign invention has not been brought into public use in the United States.

91. *Caveats.*—A citizen or alien of one year's residence, intending to become naturalised, who wishes for time to perfect his invention, may file a caveat in the Patent Office, which, for the space of one year, will prevent any applicant from obtaining a patent for an invention of a similar character, without notice being given to the caveator.

This notice requires him to complete his application within three months, and if the two applicants appear to make similar claims, the commissioner will appoint a day for hearing both parties, that is, will "grant an interference," and will direct a patent to issue to him who shall prove to be the original inventor.

A caveat may be renewed from year to year during the time that an applicant is perfecting his invention.

A foreigner cannot file a caveat.

The fee for a caveat is $15 (£3).

92. On making applications for letters patent, there are six requisites to which attention must be paid:—

1st. The petition addressed to the commissioner of patents.
2nd. The specification.
3rd. The oath of originality.
4th. Drawings.
5th. Model, or specimens of the invention.
6th. Proper fees.

The petition for a grant must be addressed to the commissioner of patents, and state that the requirements of the Act have been complied with. It must be signed by the inventor, or if he be dead, by his legal representatives.

93. *The Specification.*—The specification differs but little in its character from an English specification.

It must be "a written description of the invention, and the manner of using it, expressed in such full and clear terms as to enable a skilled person to use the same; and, in the case of a machine, must particularly specify and point out the part, combination, or improvement, claimed as an invention."

It is not, however, construed with the same rigid severity as an English specification,

For the Act, March 3, 1837, s. 9, enacts that "Whenever by mistake, accident, or inadvertence, and without any wilful default, or intent to defraud or mislead the public, any patentee shall have in his specification claimed to be the original and first inventor or discoverer of any material, or substantial part of the thing patented, of which he was not the first and original inventor, and shall have no legal and just right to claim the same, in every such case the patent shall be deemed good and valid for so much of the invention and discovery as shall be truly and *bonâ fide* his own." But it must in such a case be shown that the part really invented is a substantial part.

Power is also given to the patentee in such a case to bring an action for infringement; but if he obtain a verdict on the question of infringement, he is not entitled to costs unless he have filed a disclaimer "prior to the commencement of the suit," which may happen to be subsequent to the act of infringement.

There is a further provision "that no person be entitled to the benefits of this enactment who shall have unreasonably neglected or delayed to enter at the Patent Office a disclaimer."

The specification is drawn up and filed *before* the grant of the patent to which a copy is annexed—the two being construed together as one document.

The patent may be dated from the time of filing the specification and drawing, if it be more than six months previous to the actual issue.

94. The oath or affirmation is a statement annexed to the specification, signed by a person lawfully qualified to administer an oath, certifying that the applicant had made oath in proper form that he believed himself to be the original inventor of what he claimed, and that he did not know or believe that the same was ever before known or used. If he be a resident alien, intending to become a citizen, that circumstance also must be stated on oath.

95. Drawings, models, and specimens are always absolutely requisite whenever the case admits of their being supplied.

96. The fees payable are as follow:—

If the application be made by a citizen, or foreigner who has resided for one year previous to his application, and made oath of his intention to become a citizen, the fee is - - - - - -	$30 (£6)
If a subject of Great Britain - -	$500 (£105)
If any other foreigner - - -	$300 (£63)

The principle on which this scale appears to have been drawn up will be alluded to hereafter.

When these six requisites have been furnished, the application is taken up in its turn, unless the commissioner should otherwise decide for convenience of classification, or unless the applicant has already taken out a foreign patent. For, since an American patent can only run for fourteen years from the date of a foreign patent, the applicant would suffer by delay.

97. The examination of the documents furnished to the Patent Office with the application is very strict, and the claims in respect of novelty undergo long consideration; all claims savouring of a "double use" being, as was before stated, rejected.

If the drawings or specification are found defective, they are returned to the applicant with instructions how to alter them.

If it be deemed advisable to prepare new papers, the originals must be returned, and if the character of the invention is materially changed after the application is filed, it must be withdrawn altogether, and a new one filed, two-thirds of the former fees being allowed.

If, on examination, the claims are found to embrace what, in the judgment of the examiners, is considered to be old, the application is at once rejected, and notice is given to the applicant, with a full statement of the grounds of the rejection, and reference to prior inventions which he may examine in the office.

He has also the opportunity of explaining his claims to the examiner in a private interview.

If, in the end, he is dissatisfied with the decision of the Commissioner of Patents, he may appeal to the District Judge of Columbia, on paying $25 (£5), and a still further appeal may be made by bill to a court of equity.

When, on an examination of an application, it is found that a caveat has been entered for a similar invention within the previous year, notice is given to the caveator to complete his application within three months; and if, on its coming in, the claims are found to be conflicting, an "interference" is granted.

When an applicant claims anything embraced in an unexpired patent, and persists in his claims to priority, the commissioner will, at his request, "grant an interference" between him and the patentee.

The Office has, however, no power over the patent, even though it decide in favour of the other party, and grant him also a patent for his claim.

The unsuccessful party is allowed an appeal to the District Judge of Columbia.

98. If additional improvements be made to an invention subsequent to the date of a patent, they may be added to the specification, and incorporated with the original patent: fee, $15 (£3).

The object of this provision appears to be to save an inventor the extra expense and trouble of taking out a new patent, comprising his recent inventions, and founded on his original claims.

The incorporation of new claims in a patent bearing an antecedent date, seems open to great objection.

99. *Re-issue.*—The specification and claims of a patent undergo considerable modification in the case of a re-issue, and the provision is one liable to entail great abuses.

Section 13 of the Act of 4th July, 1836, enacts that when a patent is inoperative, or invalid by reason of a defective or insufficient description or specification, if the error arise from inadvertency, accident, or mistake, and without any fraudulent or deceptive intention, the commissioner may, on the surrender of the old defective patent, "cause a new patent to be issued for the same invention, and for the residue of the period then unexpired for which the original patent was granted, in accordance with the patentee's corrected description and specification; and the patent so re-issued, together with the corrected descriptions and specifications, shall have the same effect and operation in law, on the trial of all actions hereafter commenced, for causes subsequently accruing, as though the same had been originally filed in such corrected form, before the issuing of the original patent." The fee for a re-issue is $15 (£3).

But if it be found that the specification comprises several distinct substantive inventions, a patent is issued for each, and the fee for each is $30 (about £6).

It is obvious that there is scarcely any limit to the permutations and combinations which may be made out of the claims of a long, complicated, and ambiguous specification.

Modern improvements are seldom or never so new in character and form as to be entirely dissimilar to every previously patented invention.

It frequently happens that there exist a variety of patents whose claims are similar in character, and which are all worthless from the lack of something which is hit upon by a subsequent discoverer, who supplies the one thing needful to success.

It may be conceived with what eagerness antedated patents would in such a case be "surrendered"—with what ingenuity their claims would be strained and distorted so as to embrace the identical one thing, and embody it in a "re-issued" patent, bearing the same date as the old one, and thus rob the really meritorious inventor of the fruits of his labours.

100. *Extension of the term of a Patent.*—The commissioner has power to grant an extension of a patent for seven years, if it shall be shown that the invention is in itself "novel, useful, and important to the public, and that the inventor has not been adequately remunerated, though he used due diligence in introducing his invention into general use."

The extension cannot be granted after the patent expires, so the application must be made a sufficient time before its expiration, to allow of a hearing and a decision, and yet not so long as to render the general statement of profits and expenses materially inaccurate.

101. *Assignment.*—An invention may be assigned by an instrument in writing, either partially or entirely, before or after a patent is obtained.

If the assignment be of the entire interest, and precede the grant of the patent, it must be recorded in the Patent Office, and then the patent issues to the assignee. If the assignment be of the entire interest, and be made after the grant, it must be recorded within three months at the Patent Office to hold good against a subsequent purchaser without notice.

102. *Refusal of Letters Patent.*—When an application for a patent is refused or withdrawn, two-thirds of the fees paid are returned, unless a caveat fee had been reckoned in the amount.

The money is paid in specie at the Patent Office, or is forwarded by mail to the applicant, or paid to his order.

103. *Designs.*—A patent for a design is granted only to citizens, or aliens who have resided for one year in the United States, and made oath of their intention to become citizens.

The fees payable are only one-half what are paid for a patent for an art or manufacture, and the term of the grant extends only to seven years.

All other regulations and provisions are the same as in the case of ordinary patents.

104. All applicants for letters patent have direct access to the examiners, and are frequently heard again and again while they explain the principles of their discoveries in personal interviews. Their applications, when defective, are returned, the defects pointed out, and also the best method of correcting them; sometimes an application is returned for correction as many as six times.

The principle of affording an applicant direct access to the Patent Office has many advantages; but it is doubtful if the long and laborious investigation which an application receives is ultimately beneficial. It seems impossible that such investigations can ever be complete and satisfactory, however great may be the skill of the examiners, however wide and extended their knowledge of arts, sciences, and manufactures.

The accumulations of business are necessarily very great, in spite of the most assiduous attention of the examiners to their duties, and the system which is adopted of assigning to each a separate department; a period of five or six months usually, and in some cases a much longer time, elapses before an application can be decided upon, a delay which is often attended with great inconvenience.

It may be doubted whether too much is not attempted by the examiners in undertaking to decide the important questions of novelty and utility, either in the case of applications allowed or rejected; and whether any such preliminary inquiries ought not to be limited to warning an applicant of what has been done or known before, and referring him to authentic sources of information, but allowing him upon such warning to take out letters patent at his own risk.

In such a case the patent might safely be left to find its proper position and value when brought before the public, and there would be ample opportunity of testing its validity and utility both by public opinion and, if requisite, ultimately in a court of law.

The policy of requiring models of inventions in every case where they can be supplied, and forming them into one vast indiscriminate collection, has been already discussed.

The abuses arising from the system of extending and altering the claims of a specification in the case of re-issues, have also been noticed.

105. *Repeal of Letters Patent.*—It appears to be a subject of much complaint, that there exist no means of repealing or quashing an invalid patent by legal proceedings, similar to those provided for by an English writ of *scire facias.* It may be true that an invalid patent is naturally disregarded by the public, but it is still a weapon of legal offence and annoyance which it would be as well to put aside altogether.

106. It remains to say a few words, in conclusion, on the scale of fees.

These are extremely moderate in the case of citizens, and the privileges and protection afforded by letters patent are most properly placed within the reach of all citizen inventors.

But foreigners labour under great disadvantages, being required, if British subjects, to pay nearly seventeen times as much as a citizen ($500), if any other foreigner, ten times as much as a citizen ($300).

The principle of retaliation, which alone can be alleged as a reason for drawing up a scale of fees so disadvantageous to foreigners, seems wanting in fairness, at least in the case to which it was most pointedly directed. For a citizen of the United States, on applying for letters patent in England, stands, and always has stood, on terms of perfect equality with British subjects.

The following is the scale of fees payable in connection with the grant of letters patent in the United States:—

On application for a design	$15	(about £3)
„ „ caveat	20	(„ 4)
„ „ patent in the case of a citizen or resident foreigner intending to become naturalised	30	(„ 6)
„ „ in the case of a British subject	500	(„ 105)
„ „ „ any other foreigner	300	(„ 63)
„ „ Disclaimer	10	(„ 2)
Addition of improvements	15	(„ 3)
Re-issue	15	(„ 3)
Extension of term	40	(„ 8)
Appeal	25	(„ 5)

Copies of letters patent are furnished by the Office on payment of ten cents (*5d.*) for every 100 words, and the cost of copying the drawings.

The charge for recording an assignment is for—

300 words and under	$1	0
Over 300 and not over 1,000 words	2	0
Over 1,000 words	3	0

CONCLUSIONS.

The parts of the United States which I visited form, geographically, a small portion of their extended territory, but they are the principal seats of manufactures, and afford ample opportunities for arriving at general conclusions.

I could not fail to be impressed, from all that I saw there, with the extraordinary energy of the people, and their peculiar aptitude in availing themselves to the utmost of the immense natural resources of the country.

The details which I have collected in this report show, by numerous examples, that they leave no means untried to effect what they think it is possible to accomplish, and they have been signally successful in combining large practical results with great economy in the methods by which these results are secured.

The labouring classes are comparatively few in number, but this is counterbalanced by, and indeed may be regarded as one of the chief causes of, the eagerness with which they call in the aid of machinery in almost every department of industry. Wherever it can be introduced as a substitute for manual labour, it is universally and willingly resorted to; of this the facts stated in my report contain many conclusive proofs, but I may here specially refer, as examples, to plough making, where eight men are able to finish thirty per day; to door making, where twenty men make 100 pannelled doors per day; to last making, the process of which is completed in 1½ minutes; to sewing by machinery, where one woman does the work of 20; to net making, where one woman does the work of 100. It is this condition of the labour market, and this eager resort to machinery wherever it can be applied, to which, under the guidance of superior education and intelligence, the remarkable prosperity of the United States is mainly due. That prosperity is frequently attributed to the possession of a soil of great natural fertility, and it is doubtless true that in certain districts the alluvial deposits are rich and the land fruitful to an extraordinary degree; but while traversing many hundred miles of country in the Northern States, I was impressed with the conviction that the general character of the soil there was the reverse of fertile.

It is not for a moment denied that the natural resources of the United States are immense, that the products of the soil seem capable of being multiplied and varied to almost any extent, and that the supplies of minerals appear to be nearly unlimited.

The material welfare of the country, however, is largely dependent upon the means adopted for turning its natural resources to the best account, at the same time that the calls made upon human labour are reduced as far as practicable.

The attention paid to the working of wood, some details connected with which I have included in the report, is a striking illustration of this. The early settlers found in the forests which they had to clear an unlimited supply of material, which necessity compelled them to employ in every possible way, in the construction of their houses, their furniture, and domestic utensils, in their implements of labour, and in their log-paved roads.

Wood thus became with them a universal material, and work-people being scarce, machinery was introduced as far as possible to supply the want of hands. The character thus given to one branch of manufactures has gradually extended to others. Applied to stone-dressing, for example, one man is enabled, as I have shown, to perform as much work as twenty masons by hand. So great again are the improvements effected in spinning machinery, that one man can attend to a mule containing 1,088 spindles, each spinning 3 hanks, or 3,264 hanks in the aggregate per day. In Hindoostan, where they still spin by hand, it would be extravagant to expect a spinner to accomplish one hank per day; so that in the United States we find the same amount of manual labour, by improved machinery, doing more than 3,000 times the work. But a still more striking comparison between hand and machine labour may be made in the case of lace making in England. Lace of an ordinary figured pattern used to be made "on the cushion" by hand, at the rate of about three meshes per minute. At Nottingham, a machine attended by one person will now produce lace of a similar kind at the rate of about 24,000 meshes per minute; so that one person can, by the employment of a machine, produce 8,000 times as much work as one lace maker by hand.

The results which have been obtained in the United States, by the application of machinery wherever it has been practicable to manufactures, are rendered still more remarkable by the fact, that combinations to resist its introduction there are unheard of. The workmen hail with satisfaction all mechanical improvements, the importance and value of which, as releasing them from the drudgery of unskilled labour, they are enabled by education to understand and appreciate. With the comparatively superabundant supply of hands in this country, and therefore a proportionate difficulty in obtaining remunerative employment, the working classes have less sympathy with the progress of invention. Their condition is a less favourable one than that of their American brethren for forming a just and unprejudiced estimate of the influence which the introduction of machinery is calculated to exercise on their state and prospects. I cannot resist the conclusion, however, that the different views taken by our operatives and those of the United States upon this subject are determined by other and powerful causes, besides those dependent on the supply of labour in the two countries. The principles which ought to regulate the relations between the employer and the employed seem to be thoroughly understood and appreciated in the United States, and while the law of limited liability affords the most ample facilities for the investment of capital in business, the intelligent and educated artizan is left equally free to earn all that he can, by making the best use of his hands, without let or hindrance by his fellows.

It may be that the working classes exhibit an unusual independence of manner, but the same feeling insures the due performance of what they consider to be their duty with less supervision than is required where dependence is to be placed upon uneducated hands.

It rarely happens that a workman who possesses peculiar skill in his craft is disqualified to take the responsible position of superintendent, by the want of education and general knowledge, as is frequently the case in this country. In every State in the Union, and particularly in the north, education is, by means of the common schools, placed within the reach of each individual, and all classes avail themselves of the opportunities afforded. The desire of knowledge so early implanted is greatly increased, while the facilities for diffusing it are amply provided through the instrumentality of an almost universal press. No taxation of any kind has been suffered to interfere with the free development of this powerful agent for promoting the intelligence of the people, and the consequence is, that where the humblest labourer can indulge in the luxury of his daily paper, everybody reads, and thought and intelligence penetrate through the lowest grades of society. The benefits which thus result from a liberal system of education and a cheap press to the working classes of the United States can hardly be overestimated in a national point of view; but it is to the co-operation of both that they must undoubtedly be ascribed. For if, selecting a proof from among the European States, the condition of Prussia be considered, it will be found that the people of that country, as a body, have not made that progress which, from the great attention paid to the education of all classes, might have been anticipated; and this must certainly be ascribed to the restrictions laid upon the press, which have so materially impeded the general advancement of the people. Wherever education and an unrestricted press are allowed full scope to exercise their united influence, progress and improvement are the certain results, and among the many benefits which arise from their joint co-operation may be ranked most prominently the value which they teach men to place upon intelligent contrivance; the readiness with which they cause new improvements to be received, and the impulse which they thus unavoidably give to that inventive spirit which is gradually emancipating man from the rude forms of labour, and making what were regarded as the luxuries of one age to be looked upon in the next as the ordinary and necessary conditions of human existence.

(Signed) JOSEPH WHITWORTH.

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NEW YORK INDUSTRIAL EXHIBITION.

Special Report of Mr. Whitworth.

Presented to the House of Commons by command of Her Majesty, in pursuance of their Address of February 6, 1854.

LONDON:
PRINTED BY HARRISON AND SON.

NEW YORK INDUSTRIAL EXHIBITION.

SPECIAL REPORT

OF

SIR CHARLES LYELL.

Presented to the House of Commons by Command of Her Majesty,
in pursuance of their address of February 6*th*, 1854.

LONDON:
PRINTED BY HARRISON AND SONS.

[1793]

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SIR CHARLES LYELL'S SPECIAL REPORT

ON THE GEOLOGICAL, TOPOGRAPHICAL, AND HYDROGRAPHICAL DEPARTMENTS OF THE EXHIBITION.

Introductory Remarks.

HAVING been requested, when I visited New York as Commissioner in 1853, to report on the Geological Department of the Industrial Exhibition, I have endeavoured to discharge this duty as well as was in my power; but the object has been less fully accomplished than I could wish, owing partly to the delay experienced in the arrangement and display of the collections of mineral and mining products and of geological and geographical maps sent for exhibition. Explanations have already been offered in the General Report of the steps taken by me to overcome the difficulties presented by this delay; and mention has been made of the assistance liberally afforded me by several eminent men of science in the United States. I take this opportunity of repeating my acknowledgments, in particular, to my friend, Mr. James Hall, Geological Surveyor of the State of New York, for the assistance which he gave me, both during my visit and after my return to England. We had previously made, together, in the years 1841, 1846, and 1852, several exploring excursions over different parts of the United States, with a view of studying the geographical and geological features of the country. On the present occasion, Professor Hall's more extensive acquaintance with the geology of the Western States, and his professional experience in all that relates to the economical applications of his science, have enabled me to complete a task which, without such aid, I could scarcely have undertaken.

CLASS I.—MINING AND MINERAL PRODUCTS.

The classification of objects in the New York Crystal Palace being essentially the same as that adopted in the London Exhibition of 1851, we have first to notice the objects of raw production, which belong to the department of Class I, entitled "Mining and Mineral Products." The New York Association for the Exhibition of the Industry of all Nations stated in their prospectus, that it was their wish so to arrange the objects belonging to this class in a separate space assigned to them, as to make them afford information similar to that derived from mineralogical and geological maps, with the additional advantage of having presented to the eye the specimens themselves derived from each mining and mineral region. These collections were also to be accompanied and illustrated by geological maps and sections and by mining plans. Such intention has been to a considerable extent carried into execution under the superintendence of Professor Silliman, jun. When we regard the immense territory of the United States, the incipient condition of many of the mining operations, and the difficulty of interesting parties immediately concerned therewith, we are more surprised at the extent and variety of objects presented, than disposed to dwell on deficiencies observable in the collections which have been brought together and arranged within a few months.

Mining Products.—The mining products which form the most prominent feature of the Exhibition consist of the different varieties of coal and metals, such as iron, lead, copper, zinc, and gold. The coal and iron-ores are derived chiefly from the eastern or Alleghany coal-field; the lead, from limestone and other rocks of silurian age, as well as from the metamorphic formations; the zinc, from metamorphic rocks in New Jersey; and the copper, from the metamorphic regions in the eastern part of the United States, but chiefly from the sandstone and trap regions of Lake Superior, the age of which has until recently been a subject of great difference of opinion among eminent geologists.

Geological Maps and Surveys.—We may here properly mention the geological maps which have been published from time to time, since they give a general view of the several districts which have yielded the various substances used for manufactures, building, ornamental purposes, or agriculture. These maps consist partly of the results of surveys, published and unpublished, undertaken by different States and by the General Government; and partly of those of more general character, in which the geological information obtained during such public surveys, and other knowledge acquired by private exertions, have been set forth.

These maps, and the sections and plans accompanying them, were but meagrely represented in the Exhibition, but some of the more important ones, already in the hands of the public, may be alluded to in connection with the mineral products of the country, the geographical position of which will thus be more readily comprehended.

Within the last twenty years geological surveys have been commenced, and completed in eight of the States, viz., Massachusets, Rhode Island, Connecticut, New Hampshire, New York, New Jersey, Delaware, and South Carolina. During the same period geological surveys have been ordered by legislative authority, and carried forward in a greater or less degree, in fifteen of the States, viz.: Maine, Vermont, Pennsylvania, Maryland, Virginia, North Carolina, Georgia, Alabama, Tennessee, Michigan, Ohio, Indiana, Illinois, and Missouri.

At the present time the surveys of Pennsylvania,* North Carolina,† Alabama, Illinois, Wisconsin, and Missouri are in progress. The others have been suspended after one or more reports of progress had been made. Of those States in which surveys are completed, we have geological maps; and in connection with the survey of Alabama, though still in progress, there is published in the first biennial Report a geological map of the State.

Various surveys and reconnaissances, which have been undertaken by the United States Government with other purposes as the main object, have nevertheless contributed to our knowledge of the geology of the regions over which they have passed. A geological survey of Oregon has recently, however, been instituted by the General Government; and similar surveys of Lake Superior and Chippewa Land Districts have been completed. The former, under the charge of Messrs. J. W. Foster and J. D. Whitney, published in 1851, has furnished us with a geological map of the southern shore of Lake Superior, and of all the northern peninsula of Michigan, and incidentally of some of the adjoining territory, affording a link which shows in a very satisfactory manner the connection between the eastern and western areas of the great silurian formation of the Northern States. The surveys of Dr. D. D. Owen in the Chippewa Land District, published in 1852, have furnished us with a geological map of Wisconsin, Minnesota, Iowa, and a part of Missouri.

Notwithstanding the incomplete condition of many of the surveys of the different States, we have from the reports of progress, and from other information obtained by individual enterprise, a very good general knowledge of the limits of the several geological formations throughout that part of the United

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* Renewed after a suspension of several years.

† A geological survey of North Carolina was made many years since by Professor Olmstead, but we believe no map was published at that time. The present survey has been in progress two years.

States east of the Rocky Mountains, and to some extent also of the country west of this range. Of the geological maps which are the results of individual enterprise, or combining the results of public surveys and private investigations, may be mentioned a geological map of North Carolina, by Professor Mitchell, published in 1842; a geological map of the Western States,* by Dr. D. D. Owen, published in the Quarterly Journal of the Geological Society of London, 1842; and a similar map, by Byram Lawrence, in 1842; a geological map of the Middle and Western States, by James Hall, published in the Geological Report of New York in 1843; a geological map of the United States and Canada, by Sir Charles Lyell, 1845; and of part of Canada and New York State, by Mr. W. E. Logan, in the Geological Society's Journal for 1852; a geological map of the United States and British Provinces, by Jules Marcou, and another by Professor Hitchcock, in 1853.

By consulting the Reports of the various States and their accompanying maps, as well as the more general maps here noticed, where this scattered information has been connected and arranged, we are able to refer to their respective geological formations all the materials presented in the Exhibition.

It is much to be regretted that during these geological surveys, a system of triangulation had not been adopted, by which means the topography and geology could have been accurately laid down at the same time. As an unavoidable consequence, the geological maps cannot present in detail the exact limits and variations of outline of the several geological formations, nor the physical features dependent on geological agencies.

GENERAL GEOLOGY AND PHYSICAL GEOGRAPHY.

Introduction.—The leading geographical and geological features of the United States exert, as in other countries, a powerful influence on the industrial occupations developed there, and on the resources of different portions of the Union. But it is in the vastness of this influence, and in the great extent of certain formations yielding particular products and devoted to particular industrial pursuits, that the United States present in many respects a different aspect from every other country of the globe. The immense and uninterrupted areas of pre-eminently agricultural character are, for the most part, destitute of valuable mineral products, except limestone and ordinary architectural materials. Certain portions of the country are thus placed at great distances from the resources of manufacturing pursuits, and consequently precluded from their natural advantages. There are other areas, of vast extent, which combine great mineral wealth, and other conditions adapted for manufacturing enterprise, with an excellent soil. Again, there are areas of mineral production situated upon the extreme confines of the inhabited parts of the country; and others which remain untouched from their remote and inaccessible position. These, however, are gradually being added to the available resources of the nation, and are destined one day, by the rapid advance of new settlements, to be in the midst of a populous and wealthy country.

In the existing condition of a country like the United States, it would be impossible to present, in any Exhibition or any Report, more than an approximation to a sketch of its industrial resources. Mining operations are for the most part in their infancy, and in certain regions new mineral resources are constantly coming to light. Indeed, so long as vast tracts of country of great agricultural capacity remain unoccupied, and while the population continues sparse and labour dear, it cannot be expected that mining and manufacturing enterprises can be carried on to the extent which the wants of the country require. The lands of highest agricultural value will necessarily be occupied first, and those regions offering less inducements to the agriculturist will remain for a long time comparatively unknown.

Beyond the mining of coal and iron-ore, and, we may perhaps now add, copper and lead, the mining enterprises undertaken have been more the result of chance and speculation, than of any systematic effort to develop the mineral resources of the country; consequently, much of that part of the United States where we may look for mineral resources of value is very little known, beyond its general geological features, and a few attractive or accidentally discovered localities of mineral wealth.

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* The Western States here spoken of are those situated on the western side of the Appalachian chain.

The geological and mineralogical surveys have mostly had for their object the determination of the limits of geological formations, with a general indication of the contained minerals or metals of value. It has not been the province of the surveyors to examine each district with the detail essential to a determination of the existence of certain ores or minerals in workable quantities, except where these substances formed a prominent feature in the surface-characters of the formation.

The private surveys undertaken with a view to mining operations have been generally limited to a particular locality or moderate area, and these reports do not often go beyond the immediate object of the investigation, viz., the present or prospective value of the tract under immediate examination.

In regard to the mining interests, beyond those of coal and iron, it may be said that the most valuable general information possessed is of a negative character. It is well ascertained that certain great areas, from the nature of the geological formations, are destitute of valuable mineral products. Theoretically, we are prepared to go further, and to say, that with the exception of a certain area comprising parts of Illinois, Wisconsin, and Iowa, where lead is known to exist, ores of gold, silver, copper, lead, zinc, and other metals cannot be sought for successfully beyond certain igneous or metamorphic formations, the limits and extent of which are ascertained.

We therefore know the areas within the limits of which mining operations must be carried on in future; but the present state of these by no means gives an adequate idea of the future magnitude of this department of national industry. In a word, the yearly experience of the United States, and the advances of the nation in this direction, prove very conclusively the broad foundations of her mineral resources.

The physical and geological character of the Eastern* United States may be comprehended in a few sentences. From the north-eastern extremity, stretching south-westerly, nearly to the Gulf of Mexico, lies a belt of mountainous or elevated and more or less broken country, sometimes rising to the height of more than 6000 feet above the level of the sea. Throughout the whole extent it presents evidences of uplifting agencies, which have operated in lines parallel to the direction assumed by the mountain chains. This mountainous country occupies nearly the whole of New England, its numerous indentations affording excellent harbours along the coast. It crosses New York at the Highlands, and to the southward gradually recedes from the coast, leaving a widening belt of more recent formations between it and the Atlantic. The States are limited on the north mainly by the course of the St. Lawrence and the Great Lakes; we have, nevertheless, only to look a little beyond this limit to find a chain of mountains running parallel to the St. Lawrence as far as its source in Lake Ontario, and thence stretching westward, and, penetrating in a few places the geographical limits of the States, it extends, with few interruptions, to the Rocky Mountains. The latter chain has a general southward course, and reaches the southern limits of the United States at about the 105th degree of longitude. The great basin, or rather plain, bounded by these ranges of mountains, and opening to the southward on the Gulf of Mexico, is, with very limited exceptions, occupied by sedimentary strata in their normal condition, and presenting, for the greater part, only slight deviations from their original horizontal position. West of the great eastern or Appalachian chain, we have a wide area of the older formations, from the lowest sedimentary rock to the coal, inclusive. These formations reach, in their widest extent, from the valley of the Hudson to beyond Council Bluffs on the Missouri River, or over a space of twenty-four degrees of longitude. Further south their breadth is considerably reduced, and they finally reach their most southerly termination, as occupying a continuous area, in the northern part of Alabama. From north to south, these formations extend uninterruptedly over nearly fifteen degrees of latitude, or from the south shore of Lake Superior, in latitude 47° 50′, to below 33° of north latitude. Such is the vast extent of the Palæozoic (or primary fossiliferous) formations in the United States, leaving out of view smaller areas not directly connected with this great plain. Of this immense territory, it is scarcely too much to say, that nearly one-half of the entire area is occupied by the coal-measures of the carboniferous period.

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* The Eastern States are those on the eastern side of the Appalachian chain.

Flanking the Appalachian chain on the east, and forming a broad belt or plateau along the Atlantic coast and the Gulf of Mexico, we have the cretaceous and tertiary formations. These extend into Texas, thence, trending to the northward, they form a wide belt between the western limit of the palæozoic formations and the Rocky Mountains chain.

Such simply are the great geological features of this vast country, the details of which, however, would require many volumes to describe.

In the midst of the cretaceous formation in Texas is an isolated mountain of older igneous or metamorphic rocks, surrounded by those of palæozoic age (*vide* Dr. F. Roemer's "Cretaceous Formation of Texas"). In Arkansas there is a belt of similar character and of greater extent, near the junction of the palæozoic and cretaceous rocks; and again, in Missouri, we have, in the midst of silurian and carboniferous strata, mountains of the older metamorphic rocks.

It is within the limits above described, and from the geological formations indicated, that the industrial resources of the Eastern United States, both agricultural and mineral, are to be chiefly derived.

In viewing the mountain barrier which lies to the east of the great central and western plain, it must not be supposed that it is impenetrable except by difficult roads, or that the country lying to the west of it presents an unbroken monotony of surface. Nearly the whole extent of the northern frontier is occupied by a chain of great lakes, navigable for the largest steamers and other vessels, and presenting, within the United States alone, a line of coast of nearly 3,000 miles, exclusive of smaller bays and rivers which communicate with the same. The several outlets from these to the Atlantic render communication as easy between the remote interior regions and the coast as between equally distant maritime cities.

The western and central portions of this great area are traversed by navigable rivers, whose great outlet, by the Gulf of Mexico on the south, invites trade and commerce in that direction. Towards the north and east the waters of these rivers are connected by canals with those of the great lakes; and numerous railroads traverse the entire territory on the east of the Mississippi River, and will soon extend to the Rocky Mountains.

It will thus readily be seen, that in considering the industrial resources of a country of such vast extent, and which is still in its infancy, a juster idea of its capabilities will be formed by studying its leading physical and geological features, than by examining collections of its minerals and rocks in any place of exhibition. With this view it will be necessary to preface the special notice of raw mineral products, by a short sketch of the principal geological formations; noticing the characteristics of each, its geographical extent, and its products.

The geological formations of the United States, which either afford materials of use, or give character to the portions of country which they occupy, may be enumerated in the following order, omitting the minor subdivisions described in detail in the Geological Reports of the various States:—

Alluvial and drift formations.
Tertiary.
Cretaceous.
Oolitic or liassic (jurassic).
New red sandstone (triassic?).
Coal measures.
Carboniferous limestone, with other rocks below the coal-bearing strata.
Old red sandstone, or Devonian formation.
Upper silurian.
Lower silurian.
Crystalline, or metamorphic rocks of the Appalachian chain, chiefly recognised as metamorphic rocks of Palæozoic age.
Older metamorphic or crystalline rocks.
Trappean rocks.

ALLUVIAL AND DRIFT FORMATIONS.

The superficial deposits referable to the Drift-period are almost universally distributed over the larger part of the United States. The presence of large boulders is usually regarded as indicative of this deposit; but these, in many instances, are absent, or not conspicuous, over large areas where the country is deeply covered with water-worn materials. In the mountainous regions the superficial deposit, lying next to the older rocks, is usually unstratified, and fragments of all sizes, more or less worn, lie confusedly mingled together; while, throughout a large part of the great plain west of the Alleghanies, this deposit is more or less regularly stratified, and the materials sorted. Everywhere, in fact, water-worn materials cover the surface of the older subjacent rocks. In all localities these older formations bear evidence of powerful erosive action, and whether in the northern portion of the United States, where boulders are frequent, or in the south, where the materials are less massive, the results are similar, and all seem referable to the same agency.

The various modifications which this deposit has subsequently undergone need not now detain us; since it is only in reference to the general character and economical relations that we are to treat of it.

As a general rule, obtaining over the Northern and Middle States of the Union, the character of this drift is dependent on the strata lying immediately beneath it, or a short distance north of the locality. Although conspicuous masses or boulders of northern rocks are found one or two hundred miles south of their origin, yet it is not to be supposed that any considerable proportion of the superficial mass has been derived from equally distant points. It is only along a few valleys or watercourses that large quantities of water-worn materials have been carried to the south. The area occupied by them is, therefore, small, compared to that which is occupied by materials derived from rocks in close proximity. Were it otherwise, or were it true that the causes transporting these northern materials were as powerful as sometimes supposed, the influence of underlying geological formations could not be relied on for producing their legitimate results upon the soil above. Over comparatively small areas of mountainous countries, it is true, this disturbing influence can hardly be over-estimated; but in the general extent of the United States the soil corresponds in character with the nature of the rocks below. This superficial deposit, when found undisturbed and resting on the older rocks from which it has been derived, usually contains a large amount of coarse materials; subsequent changes, produced by water in more or less rapid motion, have modified the original condition, separating the coarser from the finer materials, and depositing each in regular layers, unmixed with the others. At a still later period small bodies of water, remaining in depressions of this formation, have given origin to a growth of vegetation, which in its decay has been preserved in the numerous swamps and marshes, together with the bones of animals, shells, and other fossil remains. There have been also incursions of the sea, and deposits of marine sand and clays, with organic forms of marine origin, mingling with the water-worn materials of the drift or superficial accumulations.

Economical Products from the Alluvial and Drift Formations.

Gold.—This metal, which is the only one of value occurring in the formations of this age, is derived from the destruction of certain auriferous metamorphic rocks. In the Eastern* United States the gold-bearing drift is derived from a series or group of sub-crystalline metamorphic rocks, which may be denominated newer metamorphic in contradistinction to the older system of metamorphic rocks, which will be described under that name in the present Report This drift is co-extensive with the formation from which it is derived, and is found from the northern limits of the United States in Vermont and New Hampshire, along the Green Mountain range, and passes through the southeastern part of New York, extending thence along the eastern flank of the Appalachian chain to Georgia and Alabama. This drift has proved productive of gold in considerable quantities in Georgia, South Carolina, North Carolina, and Virginia; but further north it has not been wrought for gold within the limits of the United States, although it has long attracted attention in the same direction in Canada, and a considerable quantity of gold has been obtained from washings on the Chaudière river. In California the gold-bearing drift or alluvium is derived from rocks of similar metamorphic character, and probably of the same age. These auriferous sands and gravels are very extensively distributed; the collections in the Exhibition showed samples of gold from nearly 200 different washings or localities in California alone.

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* See ante, p. 6, for explanation of Eastern States.

Copper.—This metal, though occurring in the metallic form and in that of some of its ores in the drift, has never been found of economic value in this formation.

Iron Ore.—Magnetic iron-sand is a very general accompaniment of the drift in the vicinity of mountain ranges. It has not, however, been applied to economic uses. Bog-iron-ore is almost universal, though in quantities to be valuable only in comparatively few places. The hæmatite, so abundant along the base of the Alleghanies and in other localities is sometimes, it would appear, associated with clays of this formation. Specimens of these from various places were shown in the Exhibition.

Sands and Clays—Fit for the purposes of making bricks and coarse pottery, are widely and abundantly distributed; many millions of bricks are annually produced. Owing to the iron contained in the clay, they are usually of a reddish brown; but in Wisconsin, particularly in the vicinity of Milwaukie, the clay produces bricks of a drab or yellowish colour, which are so highly prized that they are transported many hundreds of miles.

Peat and Shell Marl, &c.—In a few districts of the New England States peat is used for fuel to some extent; but generally very little use is made of it for that purpose in the United States. The peaty deposit or "muck" of many of the swamp lands is much valued as manure, together with shell-marl derived from the decomposition of the shells of existing species of mollusks. Sometimes alternating strata of muck and shell-marl occur in swamps of large magnitude. It consists of an aggregation of small shells with granular or pulverulent carbonate of lime, which is deposited from springs having their origin in limestone formations, or which have percolated the calcareous drift or alluvium, carrying thence the calcareous matter dissolved in the water. In some places where the drift contains an abundance of pebbles, they are used with cement for building walls, and even houses and other buildings. In many places, in consequence of the great depth of the drift and alluvial formation, or from it overlying shaly deposits, which afford no good building material, these large pebbles and boulders become of much importance to the inhabitants of the district.

Exhibition.—The specimens in the Exhibition from this formation consisted principally of native gold, from about two hundred different washing or localities in California, and a few from other places; a boulder of native copper from Wisconsin; bog-iron-ore; ochre; marl; soil, &c.

TERTIARY FORMATIONS.

The tertiary formations proper are of marine, estuary, and fresh-water origin; consisting of numerous argillaceous, arenaceous, and calcareous beds, and of various admixtures of the like materials. These strata, containing remains of numerous shells, corals, &c., land plants and animals and fresh-water shells, have a wide range in the United States. They commence at the north-eastern extremity of Maine, if we include the deposits in the valleys of Lake Champlain and the St. Lawrence, and, stretching south-westerly, become well defined south of New Jersey, thence extending south and south-west, they occupy a broad belt between the Atlantic and the base of the mountain range. Still farther to the south and west the same formations continue to expand; and, trending westward past the southern extremity of the Highlands, spread out over the southern part of Georgia, Alabama, Mississippi, and a large part of Louisiana and Texas bordering the Gulf of Mexico. To the northward from Texas the tertiary formations extend along the base of the Rocky Mountains, forming a broad belt, flanked on both sides by the cretaceous rocks. The deposits of this age reach even to the sources of the Missouri, and spread out into the interminable wastes of that region known as the *Mauvaises Terres*.

West of the Rocky Mountains, and between that region and the Sierra Nevada, tertiary fossils have been collected by Captain Fremont and Captain Stansbury from widely separated localities, leaving no doubt of the existence of the formation on a large scale in that part of the continent. On the western coast the tertiary deposits are equally extensive and well developed, as we have learned from Dance and others (see United States Exploring Expedition: Geology by T. D. Dance); but the details have not been studied.

Economical Products of the Tertiary Formations.

Brown Hæmatite and Ochreous Iron Ore.—It has been long known that there occurs in the United States an almost continuous belt from Canada to Alabama, containing hæmatitic iron-ores, ochres, &c., and clays of a peculiar character. This ore has been regarded as an aqueous or oceanic deposit, and as having been derived from the subjacent strata through the agency of thermal springs. The discovery of a bed of brown-coal associated with the ores and clays has induced Professor Hitchcock to refer the whole to the Pliocene period; but the data for determining their precise geological age are as yet very incomplete.

The hæmatite is usually compact, fibrous, and stalactitic, and always more or less enveloped in clays of various colours. Throughout New England this formation lies at the western base of the Green Mountains, and rests upon a metamorphic limestone, which is more or less associated with talcose or micaceous slate. From these beds the iron may have been derived, as it probably has been, by the action of thermal waters at the period of the deposition of the clays.

In Pennsylvania these ores occur in depressions or fissures in the unaltered limestones of the lower silurian period, but associated with or enveloped in clays; while farther to the south, however, the hæmatites of this character are associated with metamorphic strata.

This deposit is one of the most important sources of iron-ore, and the first worked in this country, furnishing an excellent material, and readily wrought. Specimens of the ore and of the manufactured iron were presented from Vermont, Massachusetts, New York, New Jersey, Connecticut, Pennsylvania, and Maryland.

Manganese.—Black oxide of manganese occurs in numerous localities, associated with the hæmatite above-mentioned. It occurs at Brandon and Bennington, Vermont, in large quantities. The black oxide of manganese exhibited from several southern localities is probably from this formation.

Fossil Fuel.—A bed of brown-coal associated with the hæmatite and fire-clays occurs at Brandon, Vermont, and is there used as fuel. Lignites are found in many localities. Specimens of tertiary coal have also been brought from the country west of the Rocky Mountains, and from the Pacific coast.

The only specimens exhibited at the Exhibition were from Brandon, Vermont.

Fire Clays and Porcelain Earth.—Kaolin, and various coloured clays, of greater or less purity, occur in this formation along the western base of the Green Mountains. They are mainly used in the manufacture of fire-bricks and the stronger kinds of pottery. The clays are pure white, yellowish from iron, and pink-coloured from mangenese. Clays of similar character are known in several localities in New Jersey.

Another variety of clay, perhaps a little more recent in its origin, is, however, the most abundant in the State of New Jersey. It occurs in the neighbourhood of South Amboy, and is known as "potter's clay:" from this source are supplied many of the manufactories of "stone-ware" in the United States. It is associated with, or succeeded by beds of mottled clay and sand. Fire-bricks are also extensively manufactured from these beds.

Specimens were exhibited from Brandon, Vermont, and also some specimens of kaolin and fire-brick from New Garden, Pennsylvania.

Shelly Marls and Green Earth.—In New Jersey, Maryland, Virginia, and farther to the south, shelly marls, sometimes containing green-earth, but frequently without, are used by agriculturists for enriching the soil.

Building-materials.—In this formation, sand, clay, and brick-earth supply the want of good building-stones. A coarse friable sandstone occurs in some localities of the tertiary formation, but it is unfit for durable structures, as is fully shown by the Capitol at Washington, and some other buildings in which it has been used.

CRETACEOUS FORMATION.

The cretaceous formation in the eastern part of the United States makes its first appearance in New Jersey, where it was long since recognized, and from this locality were derived many of its most characteristic fossils described by Dr. Morton. It occupies a broad belt in New Jersey and Delaware; and, conforming to the extent and direction of the tertiary beds, it appears at intervals in Virginia and in North and South Carolina, wherever it is exposed by the denudation of the superincumbent tertiary beds. It thence stretches across the northern part of Georgia, central Alabama, and Mississippi, and trends northward along the outcrop of the palæozoic rocks beyond the mouth of the Ohio into the State of Illinois; thence on the west of the Mississippi, following the line of the palæozoic strata through Arkansas, it expands to a great width in Texas. Northward again, it is traced, with varying breadth, along the eastern slopes of the Rocky Mountains and the tributaries of the Missouri, beyond Fort Mandan on that river. On the whole, the cretaceous deposits extend from north to south more than twenty-four degrees, or from the tropic of cancer to the 48th degree of north latitude.

Economical Products and Agricultural Conditions.—No products have been sent to the Exhibition from this formation.

Green-earth, green-sand, or, as it is usually termed, marl, of the cretaceous series is extensively used in New Jersey and further south by agriculturists. It is sometimes nearly or entirely destitute of fossil shells; while in some localities it has large numbers of them in its composition. The fertilizing effects are mainly due to the contained potash, and perhaps also to sulphate of lime, derived from the double decomposition of sulphate of iron and the carbonate of lime from the fossil-shells.

Notwithstanding the immense extent of the cretaceous formation in the United States, no true chalk has been discovered. The calcareous beds thus far known are only useful for burning into lime, and are not used for building or ornamental purposes.

Small deposits of iron, often phosphate of iron and iron pyrites, occur in this formation, but they are not of economical value.

Lignite is found in small quantities, and fossil wood of several species is known. On the Upper Missouri and on the Yellow Stone Rivers the beds of lignite are extensive, and may at some future time be of economical value.

The area occupied by the cretaceous and tertiary formations, between the Mississipi river and the Rocky Mountains, is much greater than the whole area of silurian, devonian, and carboniferous strata between the Alleghanies and the Mississippi; and probably greater than the space occupied by all these rocks together in the limits of the Eastern United States. These formations, therefore, extending so far beyond the limits of the other formations, are destined to have an important influence in the future history of the country. Much of this great area is destitute of forests, and often of shrubs; the surface is barren, and much of it of such a character that it can never be converted to agricultural uses, being often a stiff clay, both in the cretaceous and tertiary formations. The climate is so dry that in summer the soil is parched and cracks to such a degree as to destroy all vegetation. Small alluvial tracts alone are capable of cultivation, and vast areas of country deserve to be, as they are, designated the *mauvaises terres.*

OOLITIC OR LIASSIC FORMATION.—(JURASSIC.)

The formations which have been recognised as belonging to this period occupy a belt of ten or twelve miles wide by a length of fifty miles, west of Richmond (Virginia), and may be denominated the Chesterfield basin. The Deep River basin in North Carolina is a similar formation, extending, with some interruptions, nearly across the entire width of the State. These can only be regarded as separate parts of what has been one continuous formation.* Up to the present time this is the only geological group in the United States which has from its fossil remains been positively recognized as belonging to the age of the oolite or lias.

This formation rests upon a floor of gneissoid and granite rock; and the coarser grits and sand-stones of the series consist of the cemented materials of these ancient rocks. Higher up, the rock has the character of a micaceous schist, which in the upper beds becomes highly argillaceous,

Economic Products: Coals, &c.—A distinguishing feature of the formation, and one of vast economical importance, is the existence of several valuable coal-seams. These are wrought in the vicinity of Richmond, and near the Deep River, in North Carolina. The whole thickness of the formation in Virginia is 800 feet, and the coal-seams are confined to the lower 150 feet. In some places, two or three seams are known to occur, but in the Virginia basin, to the south of James River, these various seams are united into one vast bed of from 20 to 40 feet in thickness.

The quantity of coal shipped from this basin, according to the best estimates at which we are able to arrive, is more than 150,000 tons annually. The coal-seams in the same formation in North Carolina have been less explored, and thus far no considerable quantity of coal has found its way to market, for want of means of transportation. Facilities of transport, however, are likely to be soon afforded by the completion of the slackwater navigation of Deep River.

The chief economical products of this formation are coal, mill-stones, building-stone, &c. No specimens from this formation were presented in the Exhibition.

NEW RED SANDSTONE, SHALE, AND CONGLOMERATE.

The conglomerates, sandstones, and shaly deposts so well known in the valley of the Connecticut River through Massachusetts and Connecticut, and along the Hudson River valley, and thence through New Jersey, Pennsylvania, Virginia, and North Carolina, have been usually regarded as belonging to the new red sandstone, or triassic period. In the two States last mentioned, the deposits now under consideration lie in similar insulated troughs or basins to the westward of those already described, and differing from the former more in negative than in positive characters.

This formation has its greatest breadth in New Jersey and Pennsylvania, and gradually diminishes to the south-west,—so that in Maryland [and the northern part of Virginia it is but a narrow belt, the continuity of which becomes interrupted in the latter State. These insulated basins lie in the same line as the continuous belt, and are doubtless parts of a once continuous series.

In the Connecticut River valley there is a belt of this formation, having a length of 100 miles, and a width of from ten to twenty miles. It is in this valley that it has been studied with more care than elsewhere, and from whence we have derived more of its characteristic fossils than from any other district. Its organic remains consist of fossil plants of the genus *Voltzia* and others, numerous fossil fishes, also bipedal tracks which seem for the most part referable to birds, together with those of quadrupedal animals.

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* The question of the age of the interrupted belt farther west, which is also a continuation of the formation in New Jersey, and the same as that of the Connecticut River valley, is not yet fully determined.

Economical Products of the New Red Sandstone Formation.

Building-stones.—The Connecticut sandstone, though occupying a very limited area, furnishes at the present time more architectural and common building-materials than perhaps all other geological formations in the country. The stone is supplied to all the maritime cities of the United States, and even to the interior.

This sandstone is likewise quarried in New Jersey, and at some points on the Hudson River, in the State of New York. The stone used in the construction of Trinity Church, in New York City, is sandstone of this age, from the Passaic River, New Jersey.

Copper and Lead.—The only metals or ores of importance known in this formation are those of copper and lead. In several localities in Connecticut copper ores occur in this rock, though they have been wrought with but partial success. The principal mine in this rock in Connecticut is the Simsbury copper mine, in the town of Granby. The ore is vitreous copper, with small quantities of variegated copper and malachite. The mine has not been worked for several years.

In New Jersey it would appear that this formation affords copper ores in many localities; but, notwithstanding numerous attempts to work them at different times, they have been finally abandoned. The blue and green carbonates are the prevailing ores. The grey and blue sulphuret, with red oxides of copper, have been found in some of the mines; and, more rarely, native copper, and phosphate and silicate of copper. The ores do not occur in regular veins, but appear to be disseminated through certain layers of the slaty part of the formation; sometimes aggregated in considerable quantities, and giving promise of success to the mining operations.

In Pennsylvania, in the counties of Montgomery and Chester, some of the productive veins of lead and copper ores, which lie near the junction of this formation with the gneiss rocks, penetrate both systems, while other veins lie wholly within one or the other set of strata.* The localities mentioned afford large quantities of lead and copper ores; and some of the mines are producing valuable returns. The veins in the shales and sandstones are observed to be more prolific in copper than in lead; and the same lode, which is lead-producing in the gneiss, becomes copper-bearing in the superior rock; or the lead-ores become greatly reduced, and the copper largely preponderates.

The principal ores are sulphuret and phosphate of lead, and sulphuret and carbonate of copper. † These ores will be again referred to in the description of the older metamorphic rocks.

Exhibition.—Besides the specimens from the Wheatley mine, the products of this formation in the Exhibition were rough specimens and small blocks of dressed sandstone from the quarries at Portland, Connecticut, on the Connecticut River; also sulphate of baryta from Cheshire, Connecticut.

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* Report of Professor H. D. Rogers on the Wheatley, Brookdale, and Charlestown mines.

† The Wheatley mine, which is in one of the lodes penetrating both the gneissic and sandstone formations, has afforded the following minerals, all of which were represented at the Exhibition:—

Sulphate of Lead, crystallized.
Phosphate of Lead.
Arseniate of Lead.
Molybdate of Lead.
Chromomolybdate of Lead.
Arsenio-phosphate of Lead.
Antimonial Sulphuret of Lead and Silver.
Sulphuret of Lead.
Sulphuret of Zinc.
Carbonate of Zinc.
Silicate of Zinc.
Sulphuret of Copper.
Green Malachite.
Blue Malachite.
Black Oxide of Copper.
Native Copper.
Oxide of Manganese.
Native Sulphur.
Native Silver.
Quartz, crystallized.
Cellular Quartz.
Oxide of Iron with Silver.
Brown Hæmatite.
Brown Spar.
Sulphate of Barytes.
Iron-pyrites.

COAL-FORMATION, OR COAL-MEASURES.

The series of sedimentary and other deposits, constituting what is usually designated as the Coal-measures, or great Coal-formation, are, in the United States, extremely similar to those of Europe. The foundation or underlying rock is usually a conglomerate, or coarse sandstone, with quartz-pebbles. In some parts this rock is not present, and shaly beds with coal rest upon the limestone below. The succeeding beds consist of sandstones more or less fine, sometimes of conglomerate, or conglomeratic sandstone, shale, limestone, coal, and fire-clays. The immense thickness of this formation in some localities is truly astonishing, and the changes of condition that must have been required to produce the alternation of beds of different materials, and of such magnitude, is no less a matter of surprise.

The great coal-formation of the United States is one of its principal and most striking geological features, as it is by far the most important of all in its economical influences. The eastern Alleghany or Appalachian coal-field extends from the extreme northern part of Pennsylvania to the central part of Alabama, its length being more than 750 miles, and its greatest breadth more than 180 miles; exclusive of the anthracite basins which lie detached upon the eastern side of the main field. The superficial area of this coal-field has been estimated, by Professor H. D. Rogers, at about 63,000 square miles.

The great western coal-field, or, as it has been usually termed, the Illinois coal-field, occupies the larger part of the State of Illinois, and parts of Indiana and Kentucky. The late surveys of Dr. D. D. Owen have shown that this coal-field has, in its full limits, a much greater extension in Iowa and Missouri than had before been supposed.

It is true that the part west of the Mississippi River is not only separated from the eastern or Illinois portion by the river-channel, but that this river runs along a gentle anticlinal axis, the elevation of which has contributed in part to the separation of these two portions of the great western coal-field.

This western portion, lying in the States of Iowa and Missouri, occupies an area two-thirds as great as that part on the east of the Mississippi. It is the opinion of Mr. Hall, and other geologists of note, that this coal-field extends to the south-west beyond the limit of any careful geological explorations as yet made, though probably not reaching beyond the parallel of the silurian and metamorphic regions of southern Missouri.

Its greatest extent from the south-east to the north-west, or from the head-waters of Green River, in Kentucky, to its northern limit on the Des Moines River in Iowa, is more than 550 miles; while its greatest breadth across Illinois and Missouri, in an eastern and western direction, is more than 400 miles; and from its northern termination in Iowa, to its present known limits on the Osage River at the south, is more than 300 miles.

This western coal-field, therefore, including the area on both sides of the Mississippi, has a much greater superficial extent than the Appalachian coal-field. Indeed, that portion alone of this western field which lies east of the Mississippi has a superficial area nearly equal to the Appalachian coal-field; while that on the west of that river adds fully half as much more to the entire extent.

Still farther to the south, we know that a coal basin of considerable extent exists in Arkansas. This was perhaps originally a part of the same field as that in Iowa and Northern Missouri, and may have been separated from that by the elevation of the belt of metamorphic rocks; or this belt may have existed in its present elevated form as an island in the ancient ocean in which the sedimentary materials of the coal formation were deposited. Other coal basins, either as small detached areas, or as parts of one great field, are known to exist still farther to the south and west; and from the fact that the great underlying carboniferous limestone has been traced into New Mexico, and at intervals to the Rocky Mountains range, still farther north, we may infer that the coal measures will be found, if not co-extensive with it, to occur at least at intervals and in isolated basins over this vast area.

Besides these, there is a smaller field in Michigan, which has thus far proved unproductive, and which from its position, in a low flat country, is not likely to become available at present. Its geographical position is such as would give it superior advantages, lying as it does upon the navigable waters of Lake Huron, and being more accessible to the commerce of the great northern lakes than either of the other coal-fields. At the present time we have too little accurate knowledge regarding it to speculate as to its future comparative importance.

There is likewise a small area of the nearly unaltered coal-measures,* in Rhode Island and Massachusetts. The relative position of these beds, together with those of Nova Scotia, when viewed in connection with the age and character of the intervening country, suggests the idea that these detached portions may once have been united with the Alleghany coal-field; and further, that this was originally continuous with the western field; and, in fact, in their original or undisturbed condition, the carboniferous formations may have been nearly co-extensive with the area of that part of the United States lying east of the Rocky Mountains.

In conclusion, besides these immense and inexhaustible coal-fields on the east of the Rocky Mountains, specimens of coal have been brought by Captain Stansbury from beyond Fort Laramie; coal has also been obtained at Bellingham Bay on Puget's Sound, Washington Territory; little is known, however, of the age or geological associations of either. The specimens of the latter are so similar to the ordinary bituminous coals of the coal-measures, that no essential difference is perceptible, and we are thus led to hope that on the western coast of the United States this important source of progress and wealth may be found.

Economical Products.

Coal of the Coal Formation.—The rapid disappearance of the forests from the northern and middle portions of the United States, together with the steady and increasing advancement in manufacturing operations, have necessitated the general use of mineral fuel. Although comparatively but few years have elapsed since the introduction of coal into use as ordinary fuel, the present enormous and steadily increasing consumption renders the consideration of supply, and the means of bringing this supply within the facilities of transportation to towns and cities, a matter of great importance.

The earlier manufacturing operations of the United States began in New England, where the abundance of water-power compensated for the absence of mineral fuel, and supplied the requirements of the manufacturer. At the present time, however, since the American coal-formations are better known, and the supply has kept pace with the wants of the community, it is beginning to be felt that manufacturing operations must depend upon the abundance and unfailing supply of fossil fuel. The ratio of increase in the consumption of anthracite coal in the United States may be understood from the fact, that in 1820, 365 tons were used; while in 1847, the increased demand reached the amount of nearly 3,000,000 tons; and of bituminous coal during the same year, more than 2,000,000 of tons were consumed.†

In 1851, it was estimated that the bituminous coal consumed in Pittsburg, and shipped to southern ports, including that from the Monongahela, amounted to more than 1,000,000 tons.

The anthracite and bituminous coal-fields of Pennsylvania and Maryland, which form outliers in advance of the great coal-field, are reached with facility from the Atlantic coast. The Ohio, Monongahela, Kanawha, and other smaller but navigable streams traverse and penetrate the Alleghany field on the west, while its northern and eastern margins approach within thirty or fifty miles of Lake Erie at Cleveland, and within less than one hundred miles of Buffalo, which is the terminus of the Upper Lake navigation and the commencement of the canal navigation of New York.

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* The partially altered beds of the coal-measures here spoken of are those which are productive in coal; but I am satisfied that a much larger extent of country in New England consists of the coal measures, in a more or less highly metamorphic condition.

† R. C. Taylor's "Statistics of Coal."

On the south, the same coal-field reaches within 200 miles of the Gulf of Mexico, and is there penetrated by streams which admit the transportation of coal from the mines to tide-water; and the coal for the steam-navigation of the Gulf will eventually be supplied in that direction. At the present time, large quantities of coal are shipped down the Ohio, and thence to New Orleans, making a distance of more than 2000 miles of river navigation.

The western coal-field is traversed by the Ohio, the Wabash, the Illinois, the Mississippi, the Missouri, and the Des Moines; thus the greatest possible facilities are afforded for transportation by natural navigation. The north-eastern boundary of the Illinois coal-field reaches to within 80 or 90 miles of the southern extremity of Lake Michigan, and is connected with Chicago both by canal and railroad. Add to all these facilities for transportation the numerous railways, in progress and projected, over a nearly level or slightly undulating country, and it will be obvious that the whole of this great western country can readily be furnished with an abundant and cheap supply of mineral fuel.

The coals of the small districts included in Massachusetts and Rhode Island are anthracites of a low degree of combustibility. This character of the coal, together with the irregular condition of the beds, in the midst of a much disturbed and highly metamorphic region, have caused them to be little sought for; and of the ten or twelve workings commenced at different times, few have been continued.

The anthracite basins of Pennsylvania produce anthracite of a superior quality, and from its accessibility it has furnished a large part of the fuel used in the towns and cities of the Atlantic coast.

A specimen of anthracite coal of enormous size, from the Mammoth vein, Wilkesbarre, Pennsylvania, was presented at the Exhibition by citizens of that town. This mass showed a vertical section of the vein, being a shaft 5 feet square at the base and 30 feet high; weighing about 60 tons. Several other large masses, one 10 feet long by 4 wide, and 3½ high, were exhibited from the same locality; and specimens of the same bed from other localities.

Coals from the Carbondale and Pittstown mine, a collection of about sixty varieties of anthracite from Schuylkill county, and several other specimens of coal, were presented at the Exhibition.

Bituminous coals from Maryland were exhibited in large masses, showing the thickness of beds, 11 and 15 feet respectively. Numerous specimens of bituminous coal accompanied samples of iron-ore from several places in Pennsylvania.

A collection representing the bituminous coals of Perry, Hacking, Vinton, Jackson, and Mahoning counties, Ohio, also specimens from Kentucky and Virginia, were exhibited.

Iron-Ores.—The coal-fields of the United States contain rich deposits of the iron-ores which usually occur in the coal-measures. These are chiefly the carbonate and peroxide of iron; the latter mainly resulting from partial decomposition or change of the former, which is argillaceous, calcareous, or siliceous in its composition. In Pennsylvania and in Ohio, where these ores are wrought to a greater extent than elsewhere, the beds appear to be inexhaustible, and will supply for an indefinite period the requirements of advancing physical improvement and civilization.

In Tennessee, Alabama, and Western Virginia, the coal-formation abounds in iron-ores. In the western coal-field less is known of this connection of coal and iron, the extent to which iron is manufactured being far less than in the east. The geological survey of Illinois, now in progress, has already shown that this State is richly supplied with iron-ore in the midst of her inexhaustible coal-fields; although there are as yet but two furnaces in the State. In Missouri, iron from these ores is manufactured to some extent, yet too little is known to warrant a conclusion as to their abundance.

The iron-ores from the coal-formation presented at the Exhibition were chiefly from Pennsylvania; and from that State was furnished a very full collection, not only of the ores from the coal, but from other formations.* The collection comprised the ore and furnace-products, viz., ore, coal, slag, pig-iron, as well as manufactured iron;—ores from geological formations below the coal, and occurring in the midst of the coal-fields, being here exhibited in company with the coals by which they are smelted.

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* Further mention of these will be made under the headings of "Iron Ores."

Iron-ores from the coal-formation were exhibited from Vinton, Jackson, and Hocking counties, Ohio; and also from one locality of the coal-formation of Missouri. A good series of specimens presumed to be from the same formation were exhibited from Alabama.

In estimating the relative abundance and accessibility of this metal in the coal-formation, it will be recollected that only a small part of what is known in these immense coal-fields was represented in the Exhibition; and that what is known is comparatively but a small portion of what exists in the entire area; and when we reflect that the ores belonging to this formation, with their accompanying mineral fuel, are distributed more or less abundantly over an area of more than 160,000 square miles, we may have some faint conception of its vast amount, and of the important results of its influence on the future industrial interests of a country like the United States.

The States of Tennessee and Alabama are known to be rich in iron-ores of the coal-formation; as also Virginia and Kentucky; though specimens were exhibited from only one of these States.

Limestones.—In nearly every part of the coal-fields there occur beds of limestone of marine origin, alternating with shales, sandstones, and beds of coal. In some places the coal and limestone are in actual contact; and some of the ores occur in connection with the limestones. These beds of limestone furnish the necessary flux for the reduction of ores of iron, and also lime for ordinary building-purposes.

Sandstones.—The beds of sandstone, alternating with the shales and coal-seams, often furnish an excellent and durable building-material. Some of the more friable sandstones, which are free from iron, are used for glass-making.

Fire-Clays.—Some of the coal-seams are underlaid with beds of fire-clay, of greater or less thickness; and in some parts of the formation there are extensive beds of fire-clay not directly associated with coal-seams. This material is used for fire-bricks, stoneware or pottery, water-pipes, and drain-pipes, and is everywhere co-extensive with the great coal-fields.

CARBONIFEROUS LIMESTONE FORMATION.

The great limestone formation immediately underlying the coal-measures, and which in the carboniferous districts is usually a conspicuous feature in the topography of the surrounding country, is an unimportant and inconspicuous rock upon the margin of the greater part of the Alleghany coal-field. On the eastern margin through Pennsylvania, it can scarcely be said to exist; unless the thin bands of limestone associated with the red shale of No. XI. (Pennsylvania Geological Reports) may be regarded as this rock.

In Virginia this limestone becomes greatly expanded; and, in the southern part of the State, it acquires an important thickness. In Tennessee, following the same direction, the limestone forms a narrow belt along the eastern side of the coal-field, and continues to its southern extremity in Alabama. In Northern Alabama, upon the west and north-west sides of the coal-field, this limestone area is greatly expanded, and continues into Tennessee; forming a very conspicuous feature in the topography of the Cumberland Mountains. In the northward, however, the limestone gradually diminishes, and is finally lost before reaching the Ohio River, or becomes so merged in the adjacent sandstones as to pass unobserved.

When we turn to the western or Mississippi coal-field, we find the extent and importance of this formation greatly increased. Along the eastern side of this coal-field the limestone occupies a broad belt, extending through Indiana and Kentucky, and re-appearing on the western side of this part of the basin, or along the valley of the Mississippi, where it is deeply excavated for many miles by the channel of that river, and often forms high cliffs along its banks. It occupies a belt of country of varying width, on one or both sides of the Mississippi, from a short distance above the Ohio to the mouth of Rock River, more than 300 miles in extent, and passes both east and west under the coal-measures on either side. It appears at numerous intervals along the Missouri, and, as far as known, it forms a broad belt encircling the whole of the western division of the coal-field. Farther west it appears near Fort Laramie, and is the principal stratified rock in the vicinity of the Great Salt Lake. Its occurrence in Texas and New Mexico is also known, though its limits have not been defined. In Michigan, little is known of this formation, though limestone, referred to this period, occurs in several localities along the western side of the coal-field. The great variety of character exhibited by this limestone in the west, together with other considerations, has induced Dr. D. D. Owen to separate it into a lower and upper formation. The whole is 390 feet thick,* and is divisible into twelve different beds, characterised by lithological differences.

Thus, over an extensive region in the west, this group of limestone beds, with their layers of marl, or soft argillaceous sandstone, and marly partings with earthy beds of limestone, imparts a character of fertility to the country surrounding the western coal-field, unknown in the same geological associations elsewhere in the United States. On the northern, eastern, and western margins of the Alleghany or eastern coal-field, there is a broad belt of country in which no important calcareous formation exists; and here the limestone products can only be obtained from many miles beyond the outcrop of the coal-measures, or from the thin calcareous beds which alternate with the coal-seams. The effect of this geological difference is perceptible, not only in the architectural character of the buildings, but in the agricultural condition of the country; in the one case, the belt around the coal-measures producing a grazing country; while in the other, the corresponding belt, holding similar relations to the coal-measures, and in the same latitude, possesses a highly calcareous soil and gives origin to a grain-growing region of the first order.

But not only does the belt of country surrounding the coal-fields present this contrast of character, the regions within the areas of the coal-fields are not less strikingly different. This surrounding calcareous formation, together with the many alternating beds of limestone in the coal-measures themselves, all of which are frequently cut through by the river-channels and deep valleys, have served to distribute calcareous matter very generally and abundantly throughout the region. From this cause, perhaps, together with the accumulation of soils derived from the calcareous beds of lower formations in the northern districts, the area within the coal-fields of the west, in their wide extent of prairie and level lands, present a very different aspect from those parts of the country within the eastern coal-field, although the coal-fields hold similar geological relations.

Economical Products of the Carboniferous Limestone.

Lead.—The carboniferous limestone, throughout the greater part of its extent, preserves its normal characters, and is generally unproductive of mineral substances. In the southern part of Illinois, where the strata are much disturbed, it is traversed by several veins which have been worked for lead.† The lodes contain galena, blende, fluor-spar in large quantities, calc-spar, &c.

Lead-ores likewise occur in the carboniferous limestone of Tennessee and Alabama, but not in quantities sufficient to be wrought. A vein of lead-ore in proximity to the coal-measures is worked in Arkansas; but this may perhaps be found to be in the carboniferous limestone.

Building Stones.—This limestone affords an excellent and cheap material for building, easily quarried and dressed. Some of the beds are extremely fine-grained and compact in texture, admitting a good polish, as do also some portions of the lower beds of the limestone, which are oolitic in structure.

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* This thickness is much less than that estimated for the limestone in the same association in Virginia and Tennessee.

† The State Geologist of Illinois, Dr. J. S. Norwood, expresses much confidence in the prospective value of these veins.

Several blocks, and some smaller polished specimens of this limestone from the vicinity of St. Louis, were shown in the Exhibition.

RED SHALE OF THE CARBONIFEROUS LIMESTONE FORMATION.

In connection with this limestone it would seem necessary to notice a very important formation of red shale, which, in the absence of the limestone, lies directly beneath the conglomerate of the coal-measures. This shale formation (No. XI of the Pennsylvania survey) has a thickness of 2,949 feet at Pottsville, and extends in a broad belt along the eastern margin of the coal-fields throughout Pennsylvania and Virginia.

Economical Products: Iron.—It is economically important from being the repository of iron-ores which are wrought in many places in Pennsylvania, not only along the borders of the coal-measures, but at numerous points within the basin, where the superincumbent strata are cut through. The ores of the red shale are chiefly carbonates of iron, with variable proportions of silica, alumina, &c. They yield from 60 to 80 per cent. of carbonate of iron, and some of them yield peroxide of iron in about the same proportion. Specimens of these ores were shown in the Exhibition.

DEVONIAN FORMATION.

The group of limestones, shales, and sandstones, forming this division of the palæozoic rocks which in the United States are generally recognised as constituting the Devonian system, are a heterogenous assemblage. In the descending order, this series begins with the formation No. X of the Pennsylvania Survey; which, though it may be a debateable ground between carboniferous and devonian, will be for the present included in the latter. To this we have to add the shales and sandstones of the Cattskill Mountains, and the Chemung and Portage Groups, together with the shales and calcareous beds of the Hamilton Group of New York, and their extension westward, known as the Black Shale, and Waverly sandstone, or fine-grained sandstones of Ohio, Indiana, Iowa, &c. The whole of this series of deposits rests upon a limestone included in the same formation, and which is at least co-extensive with them.

We shall first notice the extent and general character of the sedimentary strata of the upper portion, and afterwards describe the limestone formation.

First group.—The series of strata under consideration has a far greater thickness in the eastern part of the United States, as New York and Pennsylvania, than in the western part. In the former it is clearly a littoral deposit, and the coarser materials are accumulated in this part of the formation; while towards the west, the finer materials only have been transported, and consequently the accumulation is less. For this reason also, its economical resources, and its influence upon the topography of the country and the fertility of the soil, vary to a great degree in different parts of the formation.

In those situations where we find the greatest development of these groups, the lower beds have been composed of a fine impalpable mud, succeeded by others formed of a similar fine mud, with a large admixture of calcareous matter; and sometimes the rock becomes arenaceous, with calcareous matter in smaller proportion. Succeeding this, are often some thin calcareous bands, which, however, are not constant. To these again succeed soft shales, or shaly sandstones, which are followed by arenaceous beds, and a successive alternation of these with bands of shale, of greater or less thickness. To these succeed red and green shales and sandstones, the structure being in some cases coarser than that of the lower deposits, but often shaly, or consisting of alternating arenaceous and shaly beds. This is the formation composing the Cattskill Mountains. To this must be added the formation No. X, which is a coarse sandstone or conglomerate, and sometimes a shaly mass, with an admixture of conglomerate.

This formation may be considered as occupying nearly all the southern half of the State of New York, from the Hudson River, extending along the northern outcrop of the Pennsylvania coal-basin, and forming the southern shore of Lake Erie from near Brussels, N. Y., to Cleveland, Ohio. From this point it curves round in a broad belt, skirting the coal-measures along the entire western margin, but gradually thinning out to the southward. On the east it follows the outline of the Alleghany coal-field from Pennsylvania to Alabama.

In like manner, the black slate and fine-grained sandstones encircle the Michigan coal-field, and form a broad belt, of several hundred feet in thickness, along the entire margin of the Illinois coal-field, cropping out beneath the well-marked carboniferous limestone, into which they sometimes appear to graduate, or they alternate with the lower beds of the latter rock. Along the Mississippi valley these sedimentary rocks crop out at numerous points beneath the carboniferous limestone; and the fine sandstones, so extensive in the west of this great coal-field, are probably of the same age.

Second group.—At the base of all these sedimentary deposits lies an immense limestone formation, important less from its thickness, than from the area which it occupies, and the positive evidence which we have of its once having been a continuous and uninterrupted coral-reef, over an area of not less than 500,000 square miles.

Within the limits of the United States, it is first recognized in its unaltered condition in New York, New Jersey, and Pennsylvania, and extending thence westward. Its most conspicuous outline, however, is from the Helderberg Mountains, on the Hudson River, near Albany, westward throughout the entire extent of New York. Crossing the Niagara River at Black Rock, extending through Upper Canada in a line nearly parallel to the coast of Lake Erie, and crossing into the northern part of Michigan, it forms the western boundary of Lake Huron in its northern part, quite to the Straits of Mackinac, and appears in an enormous outlier, capping Mackinac Island and Gross Cap. Its position to the south-west of these points is in the bed of Lake Michigan, having been denuded, with the softer beds beneath it, and excavated to form the bed of this lake.

The anticlinal axis extending from the western part of Lake Erie, by Cincinnati, to the southern part of Tennessee, brings up this limestone, which occupies a broad belt on either side of the lower strata that have been here elevated. In the central part of Ohio, it extends from Sandusky, south, to the Ohio river, and thence into Kentucky. It has an equal extent in Eastern and South-eastern Indiana, reaching the Ohio River at the Falls at Louisville, and passing thence through Kentucky, where it occupies a considerable area, it extends into Tennessee, skirting the irregular outline of the silurian formation of that State.

In a north-west direction from where we leave this rock in Northern Indiana, it follows a course parallel to the northern outline of the Illinois coal-field; and extending by the head of Lake Michigan across the Mississippi River, it constitutes in part the formations of the valley of the Red Cedar River in Iowa.

Notwithstanding the remarkable persistence of this group, it has nowhere a very great thickness; and indeed it is for the most part a very thin deposit, reaching, perhaps, at its maximum, no more than 350 feet, and it is usually less than 100 feet. In its north-western extension in Iowa, Dr. Owen estimates it at no more than 60 or 70 feet, and its furthest south-western limit is scarcely more than half this thickness.

Third group.—At the present time geologists are inclined to extend the limits of the Devonian system, in America, still lower than the limestone just described, and to include within the signification of this term a series of grits and sandstones which intervene between the last-named limestone and another limestone formation below. In New York two distinct members are recognised, the Cauda-galli grit, and the Oriskany sandstone. The former is a close, compact, and fine-grained mass, of a dark colour, and nearly destitute of fossil remains; while the lower member is a coarse, porous, or loosely aggregated sandstone, containing an abundance of fossils.

These grits and sandstones have their northern termination in the Helderberg Mountain, near the Hudson River; and in their extreme western prolongation they do not reach beyond 200 miles, and present several interruptions within this distance. The entire thickness in the State of New York does not reach 200 feet. The lower member of the group is much more persistent than the upper, and extends southward through Pennsylvania, and into Virginia, and in this direction acquires in Pennsylvania, according to Professor H. D. Rogers, a thickness of 700 feet.

Economical Products of the Devonian Rocks.

Iron-ore, Building Materials, &c.—A system so varied in its composition, and occupying so great an extent of country, must necessarily present a variety of useful products. The principal materials of economic value are iron-ores, limestone for lime, hydraulic limestone, building-stones, sandstone for building and for fire-stones, flagging-stones, &c.

At the junction of the Chemung and Cattskill Groups, Nos. VIII and IX of the Pennsylvania Survey, there occur bands of fossiliferous iron-ore, not unlike one to be mentioned in the Upper Silurian formation, or Clinton Group of New York. These ores yield from 30 to 50 per cent. of peroxide of iron. Iron-ores also occur associated with the limestone at the base of No. VIII of the Pennsylvania Survey.

These ores are described as of good quality and abundant in quantity, in the State of Pennsylvania, and they occur still further to the south. In the western extension of the limestone described, no ores of importance are known to occur, though the line of junction with the rock next below it is often marked with an ochreous deposit.

The only products of this formation shown in the Exhibition were a few specimens of iron-ore and limestone from Pennsylvania.

UPPER SILURIAN FORMATION.

The formations which in the United States may be included in the upper division of the Silurian system consist of limestones known in New York as the Lower Helderberg Limestone Group, which includes the following members in the descending order: Encrinal limestone, Delthyris shale limestone, Pentamerus limestone, and Water-lime. To these again succeed the Onondaga Salt Group of New York and the great limestone of Niagara, altogether constituting No. VI of the Pennsylvania survey. Below these occur a series of shales, sandstones, conglomerates, and beds of limestone, constituting the Clinton Group of New York; and the whole is terminated below by the Medina sandstone. The two latter-named formations constitute No. V of the Pennsylvania Survey.

These different members or groups of the series have a very different geographical distribution, and require to be separately noticed.

Group A.—The lower Helderberg limestones have their greatest development in the Helderberg Mountains, near the Hudson River, and in New Jersey, Pennsylvania, and Virginia. In Pennsylvania the thickness of the group is estimated at 900 feet, which is four times greater than in New York. In a south-west direction, parallel to the Appalachian chain, this group appears to be co-extensive with the other members of the palæozoic formations. Pursuing it in a westerly direction, however, we find that it thins out; and, with the exception of the lower members, it is not known beyond 100 miles west from the Hudson River. The lower member, or Water-lime, extends to the western boundary of the State.

Group B.—The second division, or Onondaga Salt Group, has a wider range, and may be traced throughout the entire length from east to west of the State of New York, and thence through Canada West, where it is often deeply covered by superficial accumulations. Its course north-westerly is in the direction of Lake Huron, where it has been entirely removed, and the basin of the lake now occupies its place. It re-appears forming the base of Mackinac Island and Gross Cap of Lake Michigan.

From these points its course is again in the direction of the basin of Lake Michigan,* from which, together with the superior limestone, it has been removed.

In Northern Ohio, west of Sandusky city, and along the Sandusky River, it has some importance; but in the southern part of that State, and in the south-eastern part of Indiana, although easily discoverable in numerous localities, its thickness is unimportant.

The most persistent member of this part of the silurian system, is the Niagara group, consisting of shale and limestone, or of limestone alone, and well known as forming the barrier at the Falls of Niagara. Although this group is often extremely thin, and with difficulty recognised, along the eastern outcrop of the palæozoic series, it becomes very important in the western part of the State of New York. In the eastern part of the State it is a thin bed of little note, but augments in thickness towards the west, producing a conspicuous feature in the topography of the country, in the great terrace, or mountain ridge, as it is termed, which extends from Rochester, by Lewiston, New York, Queenstown and St. David's, Canada West, to the head of Lake Ontario. Thence westward, this formation produces the prominent headland, Cabot's Head, between Lake Huron and Georgian Bay; and, in its continuation, it forms, in great part, the Manitoulin Islands. From these west by the Straits of Mackinac, it forms the northern shore of Lake Michigan and the peninsula between that lake and Green Bay; and continuing thence, it forms the western shore of Lake Michigan nearly to its southern extremity. Farther west, it occupies the elevated portions of the country in Southern Wisconsin and Northern Illinois, and, extending into Iowa, spreads out into a wide area between the Mississippi and the Red Cedar River.

The anticlinal axis before mentioned, which extends from Nashville to Lake Erie, brings up this limestone in the islands near the west end of that lake; and, extending thence south-westerly, it is broken through by the Lower Silurian about fifty miles north of Cincinnati, and thence extends on either side of this axis into the States of Kentucky and Tennessee, constituting the lower beds of limestone at the Falls of the Ohio, and holding the same position in the well-known fossiliferous localities of Perry county, Tennessee.

Group C.—We may for the present include in one the two succeeding formations, the Clinton group and the Medina sandstone of the New York Survey;—a series of beds consisting of shale, shaly sandstone, conglomerate, beds of limestone, iron-ore, and a massive formation of soft red sandstone at the base. This group, either entire, or represented in some of its members, is nearly co-extensive with the preceding. It follows the same course, cropping out from beneath it, and often aids in giving prominence to the bold outline of the superior limestone. This group is well developed in all its members, in the central part of New York, its most northerly limit in the United States, if we except some parts of Maine, where, however, its extent is little known, and the Green Mountains, in which it may be represented by some metamorphic rocks. From its point of greatest development in Oneida county, this formation becomes more calcareous and of less volume to the westward; and at the Niagara River, the whole formation consists of a bed of shale and a bed of limestone. North-westerly through Canada, though greatly reduced in thickness, it follows the line of the superior limestones, and is seen in the islands of Lake Huron. It is distinctly recognised on the eastern shore of Green Bay, and again in Wisconsin, which, as far as now known, is the most westerly limit of the rocks of this formation. Some of the limestone beds of this group, as defined in New York, are to the westward intimately blended with the Niagara limestone. The same is true of these rocks along the great central axis, though here the sedimentary beds of the group are scarcely to be recognised.

From the south-west end of the Shawangunk Mountain in New York, this group extends through New Jersey, and into Pennsylvania, where it attains the great thickness of 2,000 feet. It is persistent in some of its members through Virginia and Tennessee, and reaches the southern termination of the palæozoic rocks in Alabama.

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* For the origin and relative position of the valleys of Lakes Huron and Michigan, see a Paper by James Hall, in Foster and Whitney's Report on the Lake Superior Land District.

The base of the upper division of the Silurian system is marked by an immense accumulation of thick-bedded sandstone, both of coarse and fine texture, and massive strata of conglomerate, with thin beds of shale or shaly sandstone. The conglomerate often contains pebbles of large size, and frequently the materials composing these beds are but partially worn, the fragments preserving to a great degree their angular form.

Notwithstanding the coarseness of the materials of which this rock is often composed, they are so cemented as to suggest the idea that some portions of the siliceous matter may have been in partial solution at the time of the aggregation of the mass. The less rounded character of the materials, and the compact nature of the rock, together with the peculiarities of its bedding, and other features, serve to distinguish it from the conglomerates of the coal-measures.

This rock is first recognised in the valley of the Mohawk, south of Utica, where it altogether constitutes a mass of less than 20 feet in thickness, and is soon lost both towards the east and the west by thinning out, while towards the south it passes beneath the overlying formations. Seventy miles to the southward, however, it abruptly appears in great force in the Shawangunk Mountain, which commences a few miles from the Hudson River, near Kingston, and thence it ranges through the counties of Ulster, Sullivan, and Arago, to the Delaware River. The formation extends thence south-westerly, through New Jersey, Pennsylvania, Maryland, and Virginia, constituting a prominent feature in the topography of the country throughout its entire extent. Including the Shawangunk Mountain in New York, and its continuation, the Kittatinny Mountain in Pennsylvania, it forms an almost continuous mountain-range from the Hudson River in New York to the northern part of Virginia. We should not omit to observe, that although the Shawangunk Mountain terminates abruptly on the north-east a few miles from the Hudson, yet the conglomerates and coarse sandstones are infolded with the underlying slates of a preceding period, in the contorted and metamorphic rocks of Eastern New York.

This formation usually imparts a conspicuous character to the scenery and topography of the country which it traverses, and of itself it constitutes the mountain range described. The surface is usually barren, and often quite destitute of vegetation over considerable areas; and the white sandstone, often conspicuous in large naked patches, gives a peculiar aspect to some parts of the mountains.

And it is worthy of remark, that these rocks present the very significant feature of an ancient coast-line formed during a period of disturbance, and marking in the most decisive manner the period of greatest change in the fauna which occurred during the deposition of the entire series of the palæozoic rocks.

Economical Products of the Upper Silurian Rocks.

Iron-Ore.—The substance of greatest economical importance in this part of the system is iron-ore. The strata known in New York as the "Clinton Group" contain one, and sometimes two distinct beds of iron-ore, alternating with beds of limestone and shale. This iron-ore appears to be nearly co-extensive with the formation. In the western part, however, where the formation has become interrupted and thin, iron-ore is known to exist in only a single locality in Wisconsin. The ore is fossiliferous, as are the adjoining bands of limestone, and often highly calcareous in its composition. It is much prized and extensively used in the manufacture of iron in Pennsylvania and New York.

Small quantities of iron-ore occur in the superior limestones (No. VI. of Pennsylvania Survey) in Pennsylvania, but throughout the large part of the area occupied by these limestones, no ore of importance is known.

Lead, Zinc, and Copper.—Galena, blende, and copper-pyrites occur in the Shawangunk conglomerate. At the present time a lead-mine is wrought in this rock, in the Shawangunk Mountain in Ulster county; the products of the mine are galena, copper-pyrites, and a small quantity of blende. This mine has afforded some remarkably large masses of galena, one of which weighed 16,000 pounds.

Further to the southwest, within the State of New York, a vein or bed of sulphuret of zinc in the same formation has been somewhat extensively wrought.

Building-Stone and Millstones.—Limestone everywhere abounds in this part of the system, and some of the finest and most durable structures in the country are made from limestone of the Niagara group; this is evidenced in the great works along the line of the Erie Canal; and the facility with which this rock is quarried, and the proximity of navigation, have caused its extensive use; it may be recognised even in the city of Chicago, at a distance of 1,500 miles, by way of the lakes, from its source in Western New York.

The Medina sandstone and Clinton groups afford an abundance of fine flagging-stones, as well as, in some parts, excellent building-stones.

Millstones of good quality have long been manufactured from the compact conglomerate of the Shawangunk grit; this rock, in earlier treatises on American geology, was supposed to be identical with the millstone-grit of England.

Salt.—The Onondaga Salt-group, in the State of New York, yields brines of great strength, from which large quantities of salt are manufactured, affording an extensive business as well as a large revenue to the State. The salt manufactured at these *salines* in 1797, amounted to 25,474 bushels; since that time the quantity has been steadily increasing; in 1852 it amounted to 4,922,533 bushels, and in the present year the quantity will extend beyond 5,000,000 of bushels.

Although this formation yields brines for a distance of 200 miles or more along its northern outcrop, yet those which are of sufficient strength to be used in the manufacture of salt are confined within a small area in the neighbourhood of Syracuse, New York.

It should be observed, that the wells from which these brines are obtained are bored in drift or alluvium, and in only a few cases reach to the rock *in situ*. The brine occurs in the drift, having percolated from the superior beds of the group which rise above the level of this valley on the south; and its quantity or quality is not improved by penetrating the strata which lie below the gravel.

Exhibition.—The products of the Upper Silurian in the Exhibition, were specimens of iron-ore from Pennsylvania, and gypsum from New York.

LOWER SILURIAN FORMATION.

The geological formations which at the present time are included in the lower division of the Silurian consist, in the descending order, of a series of argillaceous sandstones, shales, and slates, which are known as Formation III of the Pennsylvania Survey, or the Hudson River Group, including the Utica slate, of the New York Geological Reports. To these succeed limestones of Formation II of the Pennsylvania Survey, or the Trenton, Black River, Birds-eye, and Chazy limestones of the New York Report. To these succeed, as the base of the system, the Formation I, or Calciferous and Potsdam sandstones. These three divisions of the Lower Silurian period require a few words of description separately, though in geographical extent they are, with some modifications, nearly co-extensive.

Group A.—The first-mentioned, or highest division, has a great development towards the north-east; and, entering the United States from Canada, we find it continued along the eastern shore of Lake Champlain, mostly in a partially metamorphic condition. Below Whitehall it expands, occupying a belt on the west as well as on the east side of the Hudson valley, and gradually assuming its normal character. It extends through the Hudson valley as far as Newburg, and thence following a south-westerly direction, we find it continued through New Jersey, Pennsylvania, Maryland, and Virginia, sometimes occupying a single belt of country, sometimes two or three belts, and again uniting into one. In its south-western extension it follows the general trend of the Alloghany range, and corresponds in outline to the preceding and following formations. Westward and north-westward from the Hudson River, these strata pass beneath the lower limestones of the Helderberg from Kingston on the Hudson to the Mohawk; and along this valley they continue westward with numerous undulations, finally rising to the summits of the hills on either side, as the lower rocks are elevated from beneath. Finally they spread out in a broad area upon the eastern shore of Lake Ontario. In Canada they reappear upon the northern shore of the lake, and are traced uninterruptedly to the head of Georgian Bay, Lake Huron. The basin of this bay, and its continuation in the space between the Manitoulin Islands and the main shore, are caused in part by the excavation and removal of the Hudson River Group, the higher beds of which appear on the northern margins of some of these islands. To the westward, this Group reaches the northern shore of Lake Michigan, forming Pointe aux Baies, between the Little and Big Bay de Noquet. Its place is occupied by the waters of Green Bay, near the head of which, on the eastern side, the higher portions of the group are seen passing beneath the superior limestones. It is seen along the eastern shore of Winnebago Lake, and beyond this it is lost apparently from gradually thinning out. From the Georgian Bay, westward, the character of this formation is argillo-calcareous; the higher beds consist of impure limestone, and arenaceous beds are almost entirely wanting.

This formation has a great development in the region fifty miles around Cincinnati, Ohio, and south-westerly along the axis extending through Kentucky and Tennessee. In this part of the United States it consists of alternating beds of soft shale and thin layers of limestone, with occasional traces of the shaly sandstones which are so constant and characteristic a feature of this formation in its eastern extension.

On the Mississippi River, and in numerous places in Wisconsin and Iowa, there occur some thin-bedded argillaceous limestones with seams of shale, overlying the lead-bearing rock, and holding apparently the position of the Hudson River Group. Admitting this as proved, we are able to trace this group from the north-eastern boundary of the United States, in a south-west direction to Alabama; and from the eastern line of New York, through Canada, beyond the Mississippi river; and we have good reason to suppose, from its appearance in the region of Cincinnati and Nashville, that it underlies the superior formations throughout the intervening area.

Group B.—The second division of the Lower Silurian formation, or the limestone group, consists, in its eastern extension, of four distinct members: the Trenton limestone, the Black River limestone, the Bird's-eye limestone, and the Chazy limestone. Of these the Trenton limestone is the most persistent, and often gives name to the entire group.

This series of limestones is recognized as entering the United States from the north by the St. Lawrence and Champlain valleys, and is known along the St. Lawrence quite to its mouth. We find it continuing with slight interruptions through New York, New Jersey, Pennsylvania, Virginia, and Alabama. Westward from the central part of the State of New York it extends along the valley of the Mohawk by Trenton Falls and Black River to the eastern extremity of Lake Ontario. Thence, crossing the St. Lawrence, it passes through Canada, and appears on the shores of the Georgian Bay, and along the north side of Lake Huron; it forms the greater part of the Island of St. Joseph; and, extending westward between Lake Superior and Lake Michigan, it forms the western shore of Green Bay. Thence it enters the State of Wisconsin, continuing in a course nearly parallel to the western outline of Lake Michigan to within fifty miles of the southern boundary of the State, when it bends westward and occupies a broad belt in the southern part of Wisconsin and Northern Illinois. It extends into Iowa, and, following the course of the Mississippi River, occurs, at intervals, as high as the Falls of St. Anthony. In the axis of elevation which extends from below Nashville to Lake Erie, these lower limestones are seen along the Stones River in Tennessee, and at Frankfort, Kentucky; but they do not appear north of the Ohio river.

The limestones of the Lower Silurian period are co-extensive with the superior shales over the eastern part of the United States; while in the western part, or in the Mississippi valley, they extend beyond the positively known limits of the shales.

This group of limestones, whether recognized in the several sub-divisions, or only as a single mass, is everywhere important. In all the more eastern and south-eastern localities, the group consists of limestone, with occasionally interposed layers of chert and thin slaty seams. Westward the portion of shaly matter increases, and in some places, as at the Falls of St. Anthony, it prevails to such an extent as to render a large proportion of the rock nearly unfit for all economical purposes.

There is a general diminution in thickness, and change in character of the limestones of this group as we progress westward; and in this direction commences the intercalation of another member, which is of little magnitude before reaching Wisconsin, but there becomes developed into a mass of much importance, being the lead-bearing rock (Galena limestone) of Wisconsin, Illinois, and Iowa, and formerly described in the Surveys of this region as a part of the Cliff limestone.

Group C.—The lowest division of rocks included in the Lower Silurian consists of the Calciferous and Potsdam sandstones. The former known as the Lower Magnesian limestone in the States bordering the Upper Mississippi. These two rocks often alternate with each other at the line of junction, and in numerous localities we find a friable arenaceous deposit succeeding the calciferous sandstone, being obviously due to a repetition of the same operations which produced the lower arenaceous beds.

The lower division is for the greater part nearly devoid of calcareous matter; nevertheless, in its western extension it contains partially calcareous bands. The upper or calciferous sandstone was originally so named from its combining the arenaceous and calcareous composition which everywhere marks it in varying degrees. This formation enters the United States from the St. Lawrence valley on the north-east, and stretches across the northern part of New York as far as the outlet of Lake Ontario. It may be followed down the valley of Lake Champlain, and thence with interruptions through New Jersey, Pennsylvania, Maryland, Virginia, and Tennessee. Westward through Canada, it skirts the northern shores of Lake Huron, and becomes more extensively developed on Lake Superior; from the outlet of this lake westward, it spreads out to a great width in Northern Wisconsin, and extends along the shores of the Mississippi River, forming the high cliffs which are so conspicuous a feature in the scenery between Prairie du Chien and the Falls of St. Anthony.

Economical Products of the Lower Silurian Rocks.

Iron-ore.—The large quantity of iron-ore described by Professor H. D. Rogers, in his "Geological Report of Pennsylvania," as connected with the limestones of this period, does not, we conceive, compose any part of the formation itself; but the association of the ore with various clays and other deposits clearly indicate for it the same origin as for those other deposits of hæmatite ores which have been described in this report among the products of the tertiary formation.

Lead-ores.—The most important economical product of the Lower Silurian formation is galena, or sulphuret of lead. The lead-bearing rock, or "galena limestone"[*] of Wisconsin, Northern Illinois, Iowa, and part of Missouri, is a Lower Silurian limestone which has yielded immense quantities of lead-ore for many years past.[†]

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[*] So named by Professor Hall, who first recognised it as a Lower Silurian limestone (see Geological Report of Lake Superior Land District), it having been described originally as a part of the cliff limestone of the Ohio Reports, or the upper magnesian limestone of Dr. D. Owen.

[†] The mode of occurrence of this lead-ore is somewhat remarkable, and may be noticed in this place. The metalliferous limestone is from 50 to 80 feet thick, and is a thick-bedded, porous, and friable limestone. This rock is traversed by fissures having a generally north-east and south-west direction, with others crossing these nearly at right angles. The galena occurs in the fissures, those having the most nearly north and south directions containing the largest quantity, or being the best lodes. The ore occurs with calcareous spar, and mixed with or surrounded by clay in the fissures, rarely, if ever, attached to the wall-rock or penetrating it. The limestone below the proper lead-bearing rock is a thin-bedded mass, some of the layers being slaty, and the whole with continuous open fissures. In following the lead-bearing fissures downward, they are found not to penetrate the rock below; and the lode of ore either thins out abruptly or spreads horizontally between the

The lead-ores of Missouri occur in the same rock as those of northern Illinois, Wisconsin, and Iowa, and under similar conditions. Veins of galena and blende are known in several localities of the Trenton limestone in the northern part of New York, but these have never been wrought with profit.

Copper Ores—Veins or lodes of sulphuret and carbonate of copper occur in several localities within the limits of the lead-region and in the same association, particularly at Mineral Point, Wisconsin, where these ores were formerly wrought, but ultimately proved unprofitable; they occur likewise in Missouri. They are confined to a rock of moderate thickness, and are productive in their linear extent rather than in depth. Copper ore has also been found in a lower position in the lower magnesian limestone of Wisconsin, but only in a single locality of small extent. On the south shore of Lake Superior, the lower or Potsdam sandstone is associated with extensive beds of conglomerate and an unbroken range of trap rocks which are copper-bearing. The sandstone and conglomerate contain some ores of copper, but the metallic copper occurs mainly in the trap rocks; none of the veins in sandstone or conglomerate are worked at this time.

Marble, Limestone, and Building-stones.—Some of the beds of limestone afford a black marble of excellent quality, which is extensively used, with marble of other colours, for flooring in halls and public buildings, and also for other purposes. For structures requiring heavy blocks, the lower limestones afford an abundant supply of excellent quality throughout their northern and eastern range, but are of far less value in this respect in their western extension.

The Potsdam sandstone furnishes excellent and durable building-stone and fire-stone.

The slates of the Hudson River group afford roofing-slates in numerous localities in Vermont, New York, and Pennsylvania, and probably farther south. These usually occur on the margin of the metamorphic belt; and, when either entirely unaltered, or too much changed by metamorphic action, they are unfit for this purpose.

Grindstones and Flagstones.—Grindstones of good quality are made fromthe sandstones of the Hudson River group. Flagging-stones are also abundant in many parts along the eastern exposures, and as far west as Lake Ontario. The thin-bedded Potsdam sandstone in many localities affords good flagging-stones.

Exhibition.—The products of the lower silurian rocks in the Exhibition were encrinal marble from Lake Champlain, and also roofing-slates from the semi-metamorphic slates of this formation, which may with equal propriety be referred to the formation next to be described.

UPPER METAMORPHIC ROCKS.

To draw the line between lower fossiliferous and upper metamorphic rocks is extremely difficult, inasmuch as the formations between the Hudson River and the Atlantic consist of the various palæozoic rocks already described, sometimes in a transitional state, and sometimes perfectly crystalline and devoid of organic remains. All these rocks, however, in whatever degree they may have

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laminæ or strata of the subjacent rock. It is quite impossible that the ore could have come from any source beneath the lead-bearing beds; and the only explanation that can be offered is, that they were filled from above by sulphuret of lead from solution, which, on coming to the subjacent rock with close joints, has spread out horizontally as far as it could penetrate between the laminæ, in some instances replacing the fossils of the rock. The only objection that can be offered to this hypothesis is, that whenever the lead-bearing rock is traced beneath superincumbent beds, these are are of thin-bedded argillaceous sandstone, with shaly partings, and nearly free from joints. This rock is designated the "Cap Rock" by the miners, and the lead-ore is said always to terminate abruptly against the lower side of the "Cap Rock." The mines which have been worked are mainly in the exposed surface of the lead-bearing rock, and have never been carried very far beneath where it is covered with the "Cap Rock;" and therefore the character and condition of the lodes in the lead-bearing rock beneath the overlying formation are not so well known. If the mines in this position should continue to yield as abundantly, there are still large areas of lead-bearing rocks which remain untouched; but, on the contrary, should they prove less prolific beneath the superincumbent rock, then we may regard the lead region of the West as destined to be soon exhausted. —*From Manuscript Notes of Prof. James Hall.*

undergone metamorphic action, may be classed as upper metamorphic rocks, and distinguished from an older series of crystalline rocks to which they are unconformable in stratification, as may be seen at Little Falls, New York, along the valleys of Lake Champlain and the St. Lawrence, and in numerous other localities. The upper metamorphic rocks comprise the quartz-rocks, or altered sandstones, the finely granular, often micaceous, white and coloured limestones, the schistose rocks, varying from soft and fissile black, green, and reddish slaty rocks, to the micaceous and talcose schists into which they graduate, and various gneissoid, syenitic, and hornblendic rocks—all of which can be recognized as clearly derived from stratified fossiliferous rocks of palæozoic age.*

These formations have been proved to occupy large portions of the New England States, and it is only in small areas, if at all, that the older metamorphic rocks exist within their limits. The extension of the same formation south-west, in a direction parallel to the older fossiliferous rocks, shows a wide area occupied by the rocks of this age, co-extensive indeed with the palæozoic formations from north to south.

The direction and dip of strata composing these formations are usually well preserved, though sometimes, within limited areas, they are obscured, and numerous dislocations and inverted axial folds render their study difficult.

The larger portion of this formation consists of rocks older than the coal-period; while to these we find superadded, in the eastern part of New England, the metamorphic carboniferous rocks. In numerous localities, these metamorphic rocks can be traced as positive continuations of the fossiliferous strata, the fossils gradually disappearing as the beds assume a more crystalline condition, from the gradually increased metamorphism; all doubt of the cause of the obliteration of organic remains being thus removed.

The rocks of this age produce very marked physical features in the topography of the countries which they occupy. Entering the United States on the north by the St. Lawrence valley, we find the rocks of palæozoic age, which thus far have been observed in their undisturbed and unaltered condition, assuming slight lithological changes, which increase until the strata become more or less crystalline; the fossils are gradually obliterated; the beds become elevated, often vertical, and even appear in overturned axial folds; and, rising into numerous hills and ridges, they finally assume the character of mountain-ranges, as in the Green Mountains of Vermont and the White Mountains of New Hampshire.

Devonian metamorphic.—The altered rocks of the age of the Chemung and Portage groups of New York, forming part of the Devonian, are recognized by Messrs. Logan and Hunt as appearing in great force at Gaspé, and are known to be highly developed in the State of Maine. These rocks, in their metamorphic condition, skirt the eastern part of New England, forming a part of the White Mountains; and, passing beneath the anthracite coal-formation of Massachusetts and Rhode Island, constitute with the latter the greater part of the metamorphic and crystalline formations on the east of the Connecticut River.

Silurian metamorphic.—In that portion of the country lying between the Hudson River on the west and the Connecticut River on the east, the more or less metamorphosed rocks consist of those formations already described as silurian. In the western part of this belt the quartz-rocks or hard sandstones, the crystalline limestones, and various slaty rocks terminate above by coarse gneissic and hornblendic beds, which are recognized as the altered forms of the Potsdam sandstone, the Trenton limestone group, and the Hudson River group, with occasional and interrupted beds of the Shawangunk conglomerate, infolded with the slates, and forming the summits of the most conspicuous ridges.

The upper silurian rocks have been traced by Messrs. Logan and Hunt from their unaltered condition in the St. Lawrence valley to within the boundary of the State of Vermont, where they assume the condition of micaceous limestones, interstratified with micaceous slates.

The lower part of this metamorphic formation, or chiefly that composed of the lower silurian slates and associated arenaceous beds, constitutes the true auriferous belt, as has been abundantly proved in the northern extension of these rocks, and we are well warranted, from numerous observations in the

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* Granite, which is usually referred to true igneous origin, occupies comparatively little of the area described.

Southern States, in inferring that the auriferous belt of Virginia, North and South Carolina and Georgia is of the same age. Whether the auriferous rocks of California are of the same age as those of the upper metamorphic rocks of the Eastern United States, is a question which cannot now be decided.

Economical Products of the Upper Metamorphic Rocks.

Gold.—The most prominent and important product of the metamorphic rocks of this age is gold, which occurs more or less abundantly throughout the whole extent of the formation from Canada to Georgia. The gold is obtained either directly from the rocks themselves, or from the auriferous debris derived from their destruction by natural causes. At the present time the gravel and sand, resulting from the disintegration of these rocks, are searched for gold on the Chaudière River in Canada; and gold has been found in the rocks and in the gravel in several places in Vermont and Massachusetts; though they have never proved productive of any considerable amount. From the facts here adduced, it appears to be demonstrated that the gold is not indiscriminately distributed through all the rocks of this age, but is in reality confined to a comparatively narrow belt.

Iron Ores.—The iron ores directly connected with these rocks are not often productive; though, from the decomposition of iron pyrites and other causes, beds of iron-ore of secondary origin frequently occur. Some iron-ores of this formation occur in workable quantities in Vermont and New Hampshire; and one or more beds of little economical value are known farther to the south in Massachusetts.

Chromic Iron Ores and Serpentine.—Associated with the rocks of this age occurs chromate of iron in numerous localities, from the northern limits of the United States, as far south as Virginia, and probably still farther. These ores have been wrought in Maryland and Pennsylvania.

In connection with these ores occur chlorite beds and serpentine rocks, the one apparently co-extensive with the other. The part of the formation bearing these products, however, is not continuous, but occurs at intervals where certain beds existed in the original sedimentary deposits. The serpentines, or *Verd antique*, are of beautiful varieties; and among their localities may be mentioned Millford, near New Haven, Connecticut, and Cavendish and other towns in Vermont.

Copper Ores.—Sulphurets and carbonates of copper frequently occur in the gold region of Virginia and North Carolina, and in the same formation in Maryland. The copper ores of Bristol, Connecticut, and some other localities in that State, must also be referred to rocks of this period.

Tin Ore.—The tin ore (oxide of tin) described by Dr. Jackson as found in the town of Jackson, New Hampshire, occurs in rocks of this age. Tin-ore in small quantities often accompanies the gold in Virginia and North Carolina.

Lead Ores.—Galena, carbonate, sulphate, and phosphate of lead are known in rocks of this age, but their economical value has never been fully tested. Sulphuret of lead occurs in considerable quantities in some of the copper mines recently opened in Maryland.

Silver.—Native silver occurs in Davidson county and other localities in North Carolina.

Building Stones.—Whether we regard the syenitic rocks of New England as belonging to this period, or as igneous and intrusive rock, they are nevertheless so intimately connected with these upper metamorphic rocks, that it is necessary to speak of them under the same head. The firm and durable syenite of the neighbourhood of Boston, known as Quincy granite, so much prized as a building-material, and so extensively used, belongs to this formation. Still further eastward, in the State of Maine, building-materials of this kind are wrought to considerable extent. This syenite is usually of lighter colour than that of Quincy, but becomes darker by the action of the weather.

Flagging Stones.—In nearly every part of this formation flagging-stones and step-stones of good quality are obtained.

Millstones.—The syenite in some localities is sufficiently quartzose to produce good millstones, which are manufactured in the neighbourhood of Salem in Massachusetts, and other places.

Whetstones.—The talcose and mica-slates of this age are often sufficiently siliceous to be used as whetstones or hones.

Statuary Marble.—White and variegated marble of various qualities are found in these formations. They result mainly from the metamorphism of several beds of lower silurian limestone, which vary in character in their normal condition. In the State of Vermont some beds of statuary marble of excellent quality have been found.

Fine marble occurs in numerous localities between the northern line of Vermont and the city of New York, and large quantities are obtained from Vermont, Massachusetts, Connecticut, New York, and Pennsylvania.

The marble from these localities is extensively used for building and decoration, &c., the coarser varieties for floor-tiles and ordinary building purposes.

Mica.—This mineral, which occurs in the metamorphic rocks, or associated with belts of crystalline intrusive rocks, is a substance of economical value. Large quantities are annually used for the doors and sides of stoves, which are so extensively manufactured in the United States.

The entire supply at the present time is obtained from two localities in New Hampshire, Grafton and Acworth.

Exhibition.—The products of this formation presented in the Exhibition are specimens of gold from the rocks in place in Maine, Vermont (a crystallized specimen in quartz), Virginia, North and South Carolina, and Georgia, and some from California. The principal exhibited specimens of gold were from the gravels derived from these rocks, and which have been already enumerated under the head of Drift or Alluvium. Silver was exhibited from North Carolina; copper ores from Connecticut, Maryland, and North Carolina; lead ore from Massachusetts, Maryland, and Virginia; tin ore from New Hampshire; chrome and iron ores from Pennsylvania and Maryland; plumbago from New Hampshire; varieties of marbles from Vermont, Connecticut, New York; mica from New Hampshire.

OLDER OR LOWER METAMORPHIC ROCKS.

In many parts of the United States there are broad areas occupied by crystalline rocks, which in age and lithological characters are quite distinct from the preceding. For these it is proposed to adopt the term Older or Lower Metamorphic, to distinguish them from those which are clearly altered rocks of the Palæozoic period. They are known to be of prior date, and in many cases, if not always, to have acquired their crystalline structure and metamorphic condition previously to the deposition of the surrounding sedimentary formations of the age of the oldest Palæozoic rocks. In numerous localities the Potsdam sandstone, which is the oldest known fossiliferous rock in the United States, lies in a horizontal, or nearly horizontal position against the inclined masses, or rests upon the vertical edges of the rocks of this age; proving the latter to be of long anterior date.

The formation consists in a great degree of syenite, gneiss, and various hornblendic, micaceous, and talcose schists, &c., with highly crystalline limestone: the whole still preserving evidence of stratification to a degree which warrants the opinion that they were originally sedimentary rocks which have been metamorphosed by igneous agencies. Among the evidences of the causes of this change, we find large intrusive masses of granite and other rocks generally regarded as of igneous origin, penetrating the stratified crystalline rocks, of which the system is in a great measure composed. The whole system is likewise penetrated by numerous dykes of trap, which are sometimes of great width and extent. The prevailing and characteristic rock of this formation is a syenitic gneiss, generally of firm and compact texture. The divisional planes are often obscure, and are frequently lost in the granitic or syenitic structure. One of the most constant and characteristic accompaniments of this formation is magnetic iron-ore.

The chain of mountains on the north of the St. Lawrence, and extending parallel with that river as far as the Thousand Islands, is mainly composed of this formation. We find the same rocks extending through Canada to the shores of Lake Superior, occurring on both sides of this lake, and stretching westerly to the sources of the Mississippi.

Some portions of the mountain-ranges of Maine and New Hampshire may, perhaps, belong to this formation; but the extent and limits of such portions have not been defined, nor have these beds been distinguished from surrounding rocks of more recent origin.*

In Northern New York this formation rises into mountains of 5000 feet in height, but generally its elevation is much less. In this region it occupies an area of a somewhat triangular shape, having a length of nearly 150 miles from north to south, and about 125 miles from east to west, or from Lake Champlain westward to the St. Lawrence river. The more elevated ridges are towards the centre of this tract. To the north and south it gradually dies out, not however without producing some disturbance among the superincumbent silurian rocks. In the southern part of New York this formation reappears, rising into elevated ridges and mountains, which, however, scarcely attain one-half the elevation of those in the northern part of the State. From the southern limit of New York it enters New Jersey, forming an almost continuous range of mountainous country from the New York boundary to the Delaware River. From the Delaware River to the Maryland State boundary, the older metamorphic rocks extend through the south-eastern part of Pennsylvania in two narrow belts, one of which is continuous, and the other occurs only in insulated patches in the midst of formations of more recent date.

The rocks of this age continue in the same general direction through Maryland, Virginia, and North Carolina, and are known as the Blue Ridge or South Mountains, the highest parts of which in Virginia reach the elevation of 4000 feet. Continuing south-westerly, this formation probably extends more or less interruptedly to the southern limits of the metamorphic formations in Alabama.

The rocks of this formation have been shown to occupy a broad belt on the southern shore of Lake Superior,† occupying, with some slight interruptions, the coast of the lake from the neighbourhood of Camp River to Point Abbaye; they extend westerly with gradually expanding width into Northern Wisconsin; and in the central part of that State reach as far southward as the parallel of the outlet of Winnebago Lake. Thence the course of the formation is to the north-west, reaching the Mississippi River north of the Falls of St. Anthony.

There is an isolated belt of this formation in Missouri, one in Arkansas, and another in Texas.

Economical Products of the Older Metamorphic Rocks.

Iron-Ores.—In point of economical resources this formation, both in Canada and the United States, is perhaps second only to the coal-formation. The magnetic iron-ores from Canada, forming immense veins or masses, so fully illustrated in the London Exhibition of 1851, were from the rocks of this older metamorphic period. This mineral, either as magnetic protoxide of iron, or mingled with anhydrous peroxide in various proportions, is characteristic of the formation everywhere. In Northern New York the mountains are traversed by veins or beds of the same ore, which have the appearance of intercalated beds running parallel to the schists, and having a width or thickness of from 2 or 3 feet to more than 100 feet, and can often be traced for a mile or more in length.* Numerous beds are opened in the vicinity of Lake Champlain, where the ore is largely used in manufacturing iron, and whence also it is shipped southward to the valley of the Hudson, where it is used for smelting with inferior ores, to improve the quality of the iron.

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* In Canada Mr. Logan recognised another series of metamorphic rocks, resting upon those just described, and of anterior date to the newer metamorphic; thus making three divisions. This middle formation is made up of sandstones, conglomerates with red jaspery pebbles, beds of slate, and limestone. "The slates are greenish, and highly chloritic, and often containing epidote; sometimes they assume the character of conglomerates, from the presence of pebbles of syenite."

† Report of Foster and Whitney on the Lake Superior Land District, 1851; and of D. D. Owen on the Chippeway Land District, 1852.

The ores of the Adirondack region, in Northern New York, have been successfully used in the manufacture of very fine iron and steel, which were likewise shown in the London Exhibition in 1851.† In the western part of the metamorphic region here described, the iron-ores are chiefly the peroxide or specular iron-ore. In the southern part of the same State, extensive beds of magnetic oxide of iron occur in the same rocks, and are wrought to considerable extent. In New Jersey, Pennsylvania, and Maryland, these magnetic ores are wrought; but farther south they seem to have attracted little attention.

On the southern shore of Lake Superior the rocks of this class contain extensive beds or veins of mixed magnetic ore and peroxide of iron.‡ In the western extension of the same formation, and in the vicinity of Montreal and Bad River, in Wisconsin, beds of magnetic iron-ore are known to exist.§ The iron-ores, a mixture of magnetic iron and peroxide, of the Iron Mountain and Pilot Knob in Missouri are derived from rocks of the same age. Similar ores occur in the metamorphic region of Arkansas.

Copper-Ores.—The rocks of this age in Northern New York have yielded small quantities of copper-ores in several places, but no mines have been profitably wrought. The Bruce Mine on Lake Huron, and others on the northern shore of Lake Superior, which yield copper, chiefly from the sulphurets, are in this formation, or in the intermediate metamorphic division recognized in Canada by Mr. Logan.

Lead Ores.—The lead ores of Rassie and its vicinity, in Northern New York, occur in rocks of this age. The lead and copper mines of Montgomery and Chester counties, Pennsylvania, already mentioned in connection with the new red sandstone, occur in the gneiss rocks of this system. These veins promise to yield largely of these two metals. The line of demarcation between these rocks and the newer metamorphic is not so clearly defined in the region southward as to enable us to designate with certainty the mines which may be in this or in the preceding formation. In this direction both series appear to be more prolific in ores, excepting iron, than the same formations in New England and New York.

Zinc Ores.—Zinc-blende often occurs with the lead-ores in this formation; and veins of blende, sometimes with a small admixture of galena, are found. Thus far this ore has proved of no economical value. The red oxide of zinc and franklinite of New Jersey must be regarded as of this period. The intimate connection of these products with the older gneiss rocks, and their associated minerals, point to this age; though the crystalline limestone found in the same geological association is regarded by Professor Rogers as of silurian age. The red oxide is largely used in the manufacture of the white oxide of zinc, and the mixture of this ore with the franklinite, ground in oil in its natural state, forms a brown paint which is much used. Although producing metallic zinc of excellent quality, it is not manufactured at the present time. The franklinite of the same mine has, it is said, of late been successfully used in a process by which the oxide of zinc is obtained and the iron reduced, both processes being accomplished by the same furnace operation.

Phosphate of Lime—In fine crystals, and in a massive form, occurs in rocks of this age. In one locality in Northern New York,‖ a vein or bed of this mineral was discovered, which at one time promised to prove of great value for agricultural purposes. It has, likewise, been found in considerable quantities in New Jersey.

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* The details of many of these have been given in the Geological Reports of New York, and others have subsequently been discovered.

† Jury Reports, pp. 17 and 18.

‡ Foster and Whitney's Report on the Lake Superior Land District. Part 2. 1851.

§ Dr. D. D. Owen's Report on Wisconsin, Iowa, and Minnesota.

‖ See also Mr. Logan's notice of phosphate of lime in the metamorphic rocks of Johnstown, East Canada. Geol. Journ., vol. viii., p. 210.

Porcelain Earth.—Granite proper forms but a small part of the extent of country occupied by the metamorphic rocks of the United States. It occurs in both the formations as intrusive bands, dykes, or more extended masses. Many of these granite rocks are very coarsely crystalline, and consist mainly of feldspar, with small proportions of mica and quartz. The feldspar, whether in a partially decomposed condition or in its natural state, is largely used in the manufacture of porcelain and the finer kinds of earthenware.

Marble and Building-stones.—The lower metamorphic rocks usually afford an abundance of rather coarsely crystalline limestone, with occasional beds of finer quality. None of it, apparently, can come under the designation of statuary marble; it is, however, adapted to many purposes for which the coarser varieties of white or clouded marbles are used; and in many localities it is a good building-material. In Northern New York it is sometimes mixed with serpentine, which gives it a variegated appearance. On the southern shore of Lake Superior these marbles are described as of a beautiful pink colour, traversed by veins of red; others are blue and dove-coloured, and beautifully veined. The gneiss and granite from this formation afford excellent building-materials of a great variety and colour; and in many places these may be quarried in massive blocks. The situations where the best examples occur are not easily accessible for the means of transportation to the larger cities.

Fire-stones, Hones, &c.—The talcose slates of this period often furnish good fire-stones, which, when the divisional planes of the rock are not of too frequent occurrence, and when blocks of sufficient dimensions can be obtained, may be used for the construction of iron-furnaces. Sometimes beds of a fine material, as potstone or compact steatite, are found associated with the limestone.

Some of the slates contain sufficient silica to adapt them for hones or whetstones. This material, of good quality, has been found on the south shore of Lake Superior.

Plumbago and Crystalline Minerals.—Plumbago occurs in considerable quantities in rocks of this age in Northern New York.

In some localities the rocks of this period are extremely rich in beautiful minerals. Amongst these may be mentioned, fine crystals of apatite, zircon, spinelle, sphene, augite, tourmaline, &c.

Labrador feldspar, in large crystalline masses, is not of unfrequent occurrence in Northern New York. This mineral, when polished, is very beautiful; and some of the finer specimens have been set in gold and worn as ornaments.

Exhibition.—The products of the older metamorphic rocks presented in the Exhibition were iron-ores from Northern New York, New Jersey, Pennsylvania, and Maryland; some large masses from Lake Superior and Missouri, with manufactured iron from most of the localities, and fine specimens of steel from Adirondack mines; also,—copper-ores, from Pennsylvania; lead-ores, from Northern New York and from Pennsylvania; red oxide of zinc and franklinite, with products of manufacture, from New Jersey; hone-slate, from Lake Superior.

Besides these, numerous beautiful crystalline minerals from the older metamorphic formations of Northern New York and New Jersey were exhibited.

THE TRAPPEAN FORMATIONS.

New Red Trap Rocks.—The most conspicuous formation of this kind in the Eastern United States is that which is associated with the new red sandstone, the extent of which has already been described. Accompanying the sandstone of the Connecticut River valley, trappean or basaltic rocks occur in such force as to present marked features in the topography of the country. Mount Holyoke and Mount Tom, in Massachusetts, are conspicuous examples of this kind. The East and West Rock, near New Haven, are also prominent points in the landscape, which are due to this trappean formation. Less conspicuously the trap occurs in numerous, often parallel, ridges and dykes, and in long continuous belts throughout the extent of the river valley, for 100 miles above its mouth. The Palisades of the Hudson River, and numerous prominences of trap in New Jersey, are all of the same age, and have the same geological associations. Finally, this trap-formation may be traced through Pennsylvania, Maryland, Virginia, and North Carolina, everywhere accompanying the sandstone rocks.

One of the constant accompaniments of this trap-formation is native copper; but, throughout its entire extent, it has never been found in available quantities. Other ores of copper often occur in the sandstones adjacent to the trap-rocks; and there appears to have been some connexion between the intrusion of these trap-dykes and the segregation of the copper ores. The trap-rocks of the period of this new red sandstone are often columnar in character, and their mode of weathering is by vertical joints. This feature is less prominent in the trappean rocks next to be described.

Lake Superior Trap-rocks.—The second great trap-formation is that of Lake Superior, which occurs in connexion with the sandstone of the Lower Silurian period. This formation is most conspicuously developed upon Keweenaw Point, and extends thence in a broad belt west and south-west, conforming generally to the shore of the lake. It is flanked on the northern side by conglomerates, and on the southern by sandstones; and a narrow belt of trap runs through the conglomerate parallel with the main central formation. Towards the western extremity of Lake Superior, this trap-formation becomes interrupted, and occurs only in insulated dykes or ridges piercing the sandstone. Isle Royale presents many features in common with Keweenaw Point; the range of the trap is similar and parallel, though there is but a small development of the conglomerate. On the north shore of the lake, within the territory of the United States, the trap extends in numerous narrow belts or dykes entirely to the western shore of the lake. Thence, at several points between this and the Mississippi River, above the Falls of St. Anthony, belts of trap are of frequent occurrence.

Beyond this river less is known of its extent or character; but, from the little information we have, it appears probable that the same formation occurs at intervals between the Mississippi and the Rocky Mountains.

Throughout the whole, the associations are so similar as to leave no doubt that this trap is all of the same age. On the St. Croix River it is thrust through the lingula-beds of the Potsdam sandstone in great bosses or knobs; and in Northern Wisconsin it occurs in nearly similar situations, more or less connected with the lower sandstone, but frequently associated with syenite or syenitic gneiss.

The trap-formation of Lake Superior, where it appears in its greatest development, is the repository of immense quantities of native copper, which in that region everywhere characterizes the presence of trap of a certain variety. In a map of Keweenaw Point, recently published by Mr. Whitney, United States Geologist, we find the trap of Keweenaw Point thus described. Amygdaloidal trap, bearing native copper; porphyritic trap, bearing sulphuret of copper; and crystalline trap, in which the veins are not productive. The principal part of the formation of Keweenaw Point is composed of the former kind of rock; a narrow strip passing longitudinally through the centre, represents the crystalline portions; and a broader belt on the south side, adjoining the sandstone, is of the latter variety.

Trap-rocks of the Western Regions.—From the borders of Texas to the country of the Blackfoot Indians, and still further north, trappean and basaltic rocks are found at frequent intervals. Westward, in the great plain between the Rocky Mountains and the Sierra Nevada, rocks of this character are of frequent occurrence, though we do not know their geological relations. Again, to the north-west, in the Rocky Mountains and along the Columbia as far as the Pacific coast, there are numerous and extensive basaltic and volcanic rocks. But it would require too much detail for a Report like the present, to give a connected view of all the observations that have been made upon these igneous rocks in the great area here indicated.

Trap-rocks of the Metamorphic Series.—A system of the trappean rocks of a different age, consisting of trap, greenstone, porphyry, &c., traverse the metamorphic rocks of the periods above described. These, however, rarely produce any distinct features in the topography of the country, nor do they appear to have had any connection with the upheaval of the mountain ranges in which they occur. They traverse these rocks in various directions, apparently filling fissures or joints, of which several are sometimes parallel to each other. Although these dykes occur everywhere in the United States, they are more numerous and extensive on the northern shore of Lake Huron and Lake Superior.

In the eastern part of New England, and particularly near the coast, the strata are traversed by these dykes; and more extended belts of similar rocks occupy portions of the metamorphic area. The porphyritic belts appear sometimes to have resulted from extreme metamorphism, or igneous fluidity, of previously existing formations.

Economical Products of the Trappean Formations.

Copper.—Native copper in large quantities is obtained from the trap-rocks of the Lake Superior region, where numerous mines are opened on the south shore of the lake. The copper occurs in sheets of greater or less thickness, in veins cutting the trap-range nearly at right angles, and associated with various vein-stones. These sheets of copper are of variable extent, weighing from a few pounds to 80 tons. The produce of copper from the mines of Lake Superior, during the year 1853, will reach 4000 or 5000 tons.

A mass of native copper in the Exhibition from one of these mines weighs 6,300 pounds; it is cut upon four sides, and the thickness between the two natural surfaces is more than two feet: this was cut from a mass weighing 40 tons.

The sulphurets of copper in the porphyritic trap, on the south shore of Lake Superior, have not yet been wrought to any great extent.

Silver.—The native copper contains a small amount of native silver, and this metal also occurs in small nodules or irregular masses in the copper, or attached to its exterior surface, and also in the accompanying trap.

In these cases the quantity of silver is usually small, but some masses of large size have been discovered in the *debris,* associated with lumps of native copper. More recently, a vein of silver has been wrought upon the north shore of Lake Superior. Specimens from this place were exhibited in the Exhibition.

Building-stone.—The trap-rocks, which are traversed by numerous joints, separate into irregular angular blocks used for rough walls, and to some extent for buildings. The rapid breaking down of these rocks along the Palisades of the Hudson River, by the action of water and frost, renders them accessible; and large quantities are annually transported to the city of New York and its vicinity.

GENERAL REMARKS.

From the foregoing sketch of the economic geology of so large a portion of North America, it will be seen that the great metalliferous belts of the United States are the two nearly parallel and contiguous ranges of metamorphic rocks, which extend almost uninterruptedly from the north-eastern extremity of the United States to Alabama. To these two principal zones must be added an area of considerable breadth in Northern New York, one of similar character on the south shore of Lake Superior, a small area in Missouri, one in Arkansas, and another in Texas. On the western side of the continent we have the metalliferous belt of the Pacific coast, extending through California and Oregon. Too little is known of the Rocky Mountains to enable us to speak with any degree of confidence with regard to their future mineral produce.

Permanent and productive mines of the metals will not be found beyond the areas which have been thus hastily sketched out. The general depositories of mineral wealth, therefore, are within moderate proximity to the coasts. The copper and iron region of Lake Superior lies upon navigable waters, communicating by artificial channels with the Atlantic. The coal formation, the source and foundation of every enterprise, stretches almost the whole length of the country, from the great lakes on the north to the Gulf of Mexico on the south.

The natural distribution, therefore, of these sources of wealth and power, combined with the physical features of the entire country, leave nothing to be desired, with respect to the materials and incentives for its physical progress and development.

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CLASS X.—TOPOGRAPHICAL AND HYDROGRAPHICAL SURVEYS; CHARTS AND MAPS.

Introduction.—Massachusetts is, I believe, the only State which has undertaken a trigonometrical survey of its territory; and this was independent of, or subsequent to, her geographical survey. It is certainly somewhat surprising that a people, who are straining every energy for physical advancement, should yet neglect a subject of so much economical importance.

In some of the older States such a survey is more essential than in the newer ones, and in the former there exist the means of accomplishing the object. When this is effected, and maps have been constructed combining topography and geology, these must become the foundation of every new enterprise in internal improvements, which would be planned and carried forward in accordance with the knowledge there expressed.

Under Class X we have to notice the maps and charts which exhibit progress in their several departments, or which present new facts of economical or scientific interest. The only works of this kind which particularly claim our attention, are the maps of the United States Coast Survey, under the charge of Professor A. D. Bache, and the Wind and Current Charts of Lieutenant Maury.

Coast Survey.—The coast survey of the United States, under the able direction of Professor Bache, may be regarded as by far the most important scientific work now in progress in the United States. Both in its scientific results, and in its economical and utilitarian influences, its importance cannot be over-estimated; and from these considerations we may be permitted to introduce a short sketch of its history and progress, with a general summary of the objects proposed to be accomplished, and a notice of the mode of procedure, with the results thus far obtained.*

History of the Establishment of the Coast Survey.—The importance of an accurate survey of the coast was felt by the people and authorities of the United States at an early period of their history as an independent nation; and a plan for the execution of a complete geodetic and hydrographical survey was adopted by President Jefferson, who appointed the late Mr. F. R. Hassler to the office of Superintendent.

Mr. Hassler went to Europe in 1811 to procure the necessary instruments, all of which had to be constructed; but, owing to the disturbed condition of Europe and the subsequent war of the United States with England, he was unable to obtain them, or to undertake the prosecution of the work, until the year 1817, when a commencement was made on the Bay of New York. Shortly afterwards, however, the work was suspended by the failure of Congress to appropriate funds for its prosecution; and it was not until 1832 that it was revived, Mr. Hassler being again appointed Superintendent.

At the time of Mr. Hassler's death, which occurred in 1843, the survey had been extended from the base near New York, eastward to Rhode Island, and southward to the capes of the Delaware and the upper part of Chesapeake Bay.

Professor Alexander Dallas Bache was appointed Mr. Hassler's successor; and under his direction the survey has been expanded in all its branches, and vigorously prosecuted up to the present time.

System pursued by the present Superintendent.—According to the plan developed by Professor Bache, the operations are carried on simultaneously on different parts of the coast, which, for the purposes of the survey, is divided into eleven sections, in each of which the survey is executed independently on its own base line and geographical determinations. When completed the whole will form a continuous survey of the coast, presenting an unbroken chain of triangulation; with several base lines verifying each other, and numerous determinations of latitude, longitude, and azimuth, fixing geographical positions, and contributing largely to our knowledge of the figure of the earth.

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* I take this opportunity of returning my thanks to the officers of the Hydrographical Survey at Washington, for the courteous and valuable assistance which they gave me in drawing up this part of the Report.

Plan of the Survey.—The general plan of the survey may be briefly stated as follows:—

After a reconnaissance to determine the best plan of work, a base line is measured, and a primary triangulation, having sides as long as the limits of vision or the nature of the country will allow, is carried on along the coast.

Astronomical observations to determine the latitude and direction of the meridian are made at a number of the stations, and the longitude of some cardinal point in each section is determined. Magnetic observations are also made, furnishing the variation of the compass for the charts, and incidentally the elements of the earth's magnetism.

On the sides of this primary triangulation is based the secondary triangulation, determining prominent points a few miles apart along the coast and bays, furnishing points of departure and checks for the topographical survey, which is next executed. The hydrographical survey lastly furnishes soundings and observations on tides and currents, and completes the material required for the charts, which are drawn, engraved, and printed in the office of the Coast Survey.

Constitution of the Bureau of the Survey.—The *personnel* of the survey consists of civilians and military and naval officers; the first class forming a permanent nucleus, and being composed of persons of scientific and practical ability, a great part of whom have been trained to the work under the present Superintendent; while the officers of the army and navy are put upon the survey or withdrawn from it, according as their professional duties may permit. The geodetic and topographical work is performed by the civilians and army officers, while the hydrographical survey is made by officers of the navy, all acting under the immediate orders of the superintendent, and reporting their results to him. A unity of plan is thus secured highly conducive to accuracy and despatch, and which has not been attained on similar works in other countries, where the geodetic and hydrographic surveys are carried on separately; in consequence of which the latter fails to derive from the former those data which are essential to its perfection.

Progress and method of the work of the Survey.—After this brief summary, a more detailed notice of some of the methods used in the work and its results will not be uninteresting.

Measurement of Base-lines.—Up to the year 1853, six principal base-lines had been measured, two of which are now connected by a primary triangulation. These, as well as a third, were measured with the apparatus designed by Mr. Hassler, and fully described by him in the "Transactions of the American Philosophical Society," Vol. IV, the measurement being made with iron bars and by optical contact. The subsequent bases have been measured with an apparatus designed by Professor Bache, and constructed under his direction in the office of the Coast Survey. In this apparatus the measuring bars are arranged upon the compensating system, first used by Colonel Colby in Great Britain, and by Mr. Borden in the survey of the State of Massachusetts, but the mode of obtaining the compensation differs entirely. A principle is also introduced, which, though obvious enough, had not been applied before. A bar of brass and a bar of iron, of the same dimensions, exposed to the same source of heat, will not become heated equally in equal times, the difference depending on the different conducting powers of the two metals, their different specific heats, and the different powers of their surfaces to absorb heat. The bars then, if of equal sections, will not be compensating when the temperature is changing, however perfectly the compensation may be effected at any stationary temperature. The sections of the bars must, therefore, be so proportioned to their conducting power and specific heat, as to cause both to have the same temperature during variable temperatures of the atmosphere, their surfaces being easily made to absorb equally by giving them the same coating.

The lever of contact and level, first used in the adjustment of standard measures by Bessel, has been adapted to this apparatus; the contact between two sets of bars being made by a blunt knife-edge and a plane of agate. The rapidity and accuracy with which the measurement of a base-line can be made with this apparatus can leave but little to be desired. From remeasurements made of portions of the base-line on Dauphine Island, it appeared that the probable error in measuring a mile is about two-hundreths of an inch.

The Fire Island base, on the south side of Long Island, and the Kent Island base in Chesapeake Bay are connected by a primary triangulation. The former is 8·7 miles, the latter 5·4 miles long, the shortest distance between them is 208 miles; the distance through the triangulation is 320 miles; the length of the Kent Island base, as computed from the Fire Island base, through a series of 32 triangles, differs but 4 inches from the measured length.

The principal base-lines measured are in the States of Massachusetts, New York, Maryland, North Carolina, South Carolina, and Alabama. In other sections of the survey preliminary base-lines have been measured by means of wooden or iron bars and some simple apparatus: all of these will be superseded by measurements with the apparatus described.

Apparatus for measurement of the Angles.—The instruments used for measuring the angles of the primary triangulation are a 30-inch and a 24-inch theodolite, by Troughton and Simms, both fitted with reacting micrometer microscopes, and a number of 12 and 10-inch repeating theodolites, by Gambey. The latter instruments are great favourites on account of their admirable graduation, and the principle of repetition causes them to be preferred in cases where the instrument has to be elevated on wooden structures, the perfect stability of which cannot be depended on. The Atlantic coast of the United States south of New York, and the shores of the Gulf of Mexico, being without any considerable eminences, and in general densely wooded, artificial elevations are resorted to in order to carry on a triangulation having sides of from 10 to 16 miles in length. Wooden structures, varying from 25 to 40 feet in height, have been erected on various plans by the assistants of Professor Bache, and have proved amply steady for measurements of angles with the repeating instruments.

The large (30-inch) theodolite was designed by Mr. Hassler, and is used by Professor Bache in the execution of the triangulation in the north-eastern part of the United States. Mr. Hassler followed the usual rule of observing at such times only when the conditions of vision appeared to be entirely unobjectionable. This rule is attended with serious loss of time. Mr. Bache has increased the rapidity of the work, and improved rather than diminished its accuracy, by making observations under conditions ordinarily favourable and of frequent occurrence, and applying to them the mathematical test of the least probable error, the number of observations being made dependent on their agreement among themselves. For each observation, the appearance of the signal observed has been noted, and the means have thus been obtained for a discussion of the results with reference to the condition of vision, from which it has appeared that the mean of observations, taken under various conditions of of the atmosphere, is probably to be preferred to the mean of such as have been obtained under apparently the most favourable circumstances; the corrections required to fulfil the geometrical conditions of the work being less in the former case, while a given limit of probable error can generally be reached in much less time. This result may be readily accounted for by supposing that under apparently the best condition of vision along a line, a slight lateral deflection may regularly take place, which is eliminated in the mean of observations taken under different conditions of the atmosphere.

The average correction to an observed angle required in the eastern section, where the stations are on natural elevations, and the sides average over 40 miles, is about 0″·4. In the southern sections it is rather larger. The limit of error allowed in a primary triangle is one second to an angle; this, however, is seldom reached in fact.

Observations of Latitude, and the Apparatus.—Observations of *latitude* are made at numerous stations of the primary triangulation. Different methods and instruments have been used, and the results have been carefully discussed, to determine which are the best and most available. A 2-feet vertical circle and some 12-inch repeating reflecting circles, by Troughton and Simms, 6-inch and 10-inch repeating theodolites, by Gambey, were tried successfully, but the results were found to be liable to considerable instrumental errors, and their accuracy did not repay the labour bestowed on them. Finding that instruments of a larger class were requisite, Mr. Bache procured from Mr. Simms a transit instrument, a zenith telescope, made on Captain Talcott's plan, and a zenith sector, according to Mr. Airy's design, each of the instruments having a telescope of 45 inches focal length. They were compared by observations made with each at the same stations.

The *transit* mounted in the *prime vertical* gave very satisfactory results, but its use was abandoned on account of their paucity, corresponding sets of eastern and western transits being rarely obtained on account of the cloudiness of the sky.

The *zenith telescope*, or equal altitude instrument, is a great favourite as a field instrument among American observers, although but little known in Europe. Its use consists in measuring with a micrometer the differences of zenith distance of stars culminating at nearly the same altitude, on different sides of the zenith, within a short time of each other. The British Association's Catalogue furnishes any desirable number of pairs of stars having the required relative positions. The observations with the zenith telescope being considerably more accurate than the north polar distances of the stars in the catalogue, the number of pairs of stars used has been increased, rather than the number of observations on the single pairs. In practice, from 25 to 40 pairs of stars are observed at a station, with three or four observations on each pair on different nights. The average probable error of a north polar distance in the British Association's Catalogue is 1″·7, while the probable error of an observation with one of the zenith telescopes, as constructed by Simms, is about 0″·5. The recent Greenwich Twelve Years' Catalogue frequently supplies better places of the stars, and this contributes to improve the result.

A new zenith telescope, constructed recently by Mr. Würdemann, of Washington City, on an improved plan, has been found to give results with a much less probable error than the former instruments.

For further details concerning this valuable instrument, see "Notes on the Zenith Telescope," by Professor Bache.*

The *zenith sector* of the Coast Survey is constructed on the plan communicated by Mr. Airy in the Notices of the Astronomical Society.

It is regarded by the American surveyors as an admirable instrument, and its results are considered to have about the same accuracy as those of the zenith telescope: its ponderousness, however, and the greater laboriousness of the observations, make it less desirable as a field instrument than the latter. Its capabilities, however, are far greater than those of the zenith telescope, as it measures absolute zenith distances, and it is used for determining corrections to the catalogue of north polar distances of stars observed at different stations with the zenith telescope.

When the latitudes observed at different stations are referred to one another by means of the geodetic differences of latitudes, there appear discrepancies much larger than could result from the residual probable error of observation, which can only be ascribed to local irregularities in the figure and density of the earth, and which are designated as *station errors*. They are similar to those caused by the proximity of mountains, but occur where the external configuration of the earth's crust would not indicate their existence. Mr. Bache recognized this source of error in 1844, and as a consequence, determined to carry on a continuous series of astronomical stations through the primary triangulation, in order to arrive as nearly as possible at the true figure of the portion of the earth's surface he was engaged upon.

The elements of the figure of the earth, used in these comparisons, are those obtained by *Bessel* in his last discussion of the results of ten measured arcs. It is interesting to know, that the observed difference of latitude of the extremities of the arc at present passed over by a connected triangulation agrees very closely with the geodetic difference computed on Bessel's elements. This arc extends from Maine to Maryland, over about 5 degrees of latitude and 6½ degrees of longitude. In intermediate portions of this arc, the deviation from the mean elipsoid reaches three seconds of arc and over, but without any regularity, intervisible stations differing frequently with opposite signs. The average amount of station error is between one and two seconds of arc in the eastern portion of the survey, and about half a second in the sections south of the Delaware.

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* American Journal of Science and Arts. Second Series. Vol. XIV. 1852.

Azimuth Observations.—Observations of *azimuth* are made at all the latitude stations. The instruments employed are the same that are used for the angles of the primary triangulation. The meridian is determined by observations on the pole-star, principally near its greatest elongations, where the result will be nearly independent of the knowledge of time, the star having very little motion in azimuth, and when observations taken within 45 minutes on either side of the elongation can be reduced to that position of the star by a most simple formula. The pole-star, however, moves so slowly in azimuth, even at its culminations, that the liability to error in pointing is found to be no greater at those periods than at elongations; and Mr. Bache has occasionally pursued the plan of observing on the star at equidistant times on both sides of the meridian near the culmination. In these cases the reduction is simplified into a mere taking of means; and it may be noticed, that here, as in every other process, it has been the aim of the Superintendent so to arrange the method of observing as to diminish, as far as practicable, the labour and liability to error of the computation.

The azimuths are liable to the same irregularities which affect the latitudes from local variations of level; and a comparison of azimuth observed at intervisible stations has shown the station errors to exist in the same measure as exhibited by the latitudes.

Instruments used in observing local time.—Observations of local time are made in connection with those of latitude and azimuth, the instruments employed being generally portable transits of from 26 to 48 inches focal length, constructed by Simms of London, and Würdemann of Washington. Chronometers by the best makers are used in preference to clocks (except for telegraphic determinations of longitude), on account of their greater portability and the half-seconds beat.

Observations of Longitude.—In order to fix American *longitude* in reference to European observations, observations of eclipses, occultations, and moon culminations, made at different American observatories previous to 1844, as well as the corresponding observations at European observatories, have been collected and reduced; and similar observations have since been continued at Cambridge in Massachusetts, Philadelphia, Washington, Charleston, and Cincinnati. All these stations being connected by the electric telegraph, their differences of longitude have been determined with great accuracy, and all the results are referred to Cambridge as a common station of reference.

The deference of longitude between Cambridge and Liverpool has also been determined by means of a large number of chronometers carried repeatedly between the two stations on the Cunard's steam-ships. This work is still in progress, and the intention is to accumulate so large a number of chronometric results, as to be entitled to the same confidence as that obtained from observations of the moon. It is remarkable, that while the results from occultations differ sensibly from those obtained by moon culminations, the chronometric results differ again from both, and by an amount which a larger number of results is not likely materially to diminish. It remains to be seen whether the recent corrections of the lunar theory will so modify the results depending on the moon as to produce a better agreement. For an interesting numerical comparison of these results, see Appendix, No. 26, of the Annual Report for 1851.

The differences of longitude between Cambridge and principal stations of the survey in other sections are determined by the aid of the electric telegraph, where the latter has extended. The manner in which the difference of longitude is obtained may be briefly stated as follows:—Transit instruments are mounted at both stations; at one of them an astronomical clock makes a record of its second's beats on a sheet of paper, by breaking a galvanic circuit which passes through both stations each time the pendulum passes the vertical; the times of a star's crossing the wires of the transit at each station are recorded on the same sheet by the observer's breaking the circuit by pressing a key the instant the star appears bisected on the wire. The passages of the same star over two different meridians are thus recorded by the same timepiece, and the difference of longitude results immediately after applying the necessary instrumental corrections.

The method of recording observed instants of time by means of an electro-magnet on a time-scale graduated by a clock, designated by Mr. Airy as the American method, and its application to the problem of telegraphic differences of longitude is due to the late Mr. S. C. Walker, one of the assistants on the

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coast survey, to whom Mr. Bache had entrusted the charge of the longitude department. The mechanical detail of the apparatus employed was furnished by others; and, indeed, several different modes have been devised; but it was Mr. Walker who designed the new plan, and pointed out what mechanical conditions were required to be fulfilled to attain the end in view.

In the course of these telegraphic operations, it became apparent to Mr. Walker that a far more suitable time was required for the transmission of the galvanic current through the telegraphic wires than had been generally supposed. A number of experiments made on different lines to investigate this subject showed that the velocity is between 15,000 and 16,000 miles in a second. For an interesting discussion of these experiments, giving a detailed description of the apparatus, see a paper by Dr. Gould, on the Velocity of the Galvanic Current in Telegraph Wires, in Appendix No. 25 to the Annual Report for 1851.

By means of the electro-magnetic register and telegraph, differences of longitude are determined with an accuracy nearly approaching that of the latitudes, and arcs of parallels may be measured with the same facility as arcs of the meridian.

In sections where the telegraph has not reached, as Florida, the shores of the Gulf of Mexico, and the Pacific coast, the longitudes of cardinal points are determined by observations of moon culminations and by chronometers. Corresponding observations of moon culminations are made at several American observatories, at the expense of the Coast Survey, and valuable aid is derived from the series of meridian observations of the moon made at Greenwich. The promptitude with which these have been always supplied through the kindness of the Astronomer Royal, Mr. Airy, is gratefully acknowledged by Professor Bache, and both he and his colleagues express their admiration of the manner in which the reductions are made to keep pace with the observations at the British Observatory.

The late Mr. Walker bestowed great attention on the method of longitudes by moon culminations, and arranged the details of the reduction in an admirable manner. The recent improvements in the lunar theory lead to the hope that the moon's right ascension for any given time may be represented more accurately by theory than by any single observation, in which case corresponding observations would be dispensed with, and the reduction of the longitude effected in a much simpler plan, which has been developed by Professor Pierce, of Cambridge. Extensive computations are actually in progress under the direction of the Superintendent, having for their object to test theory by observation, and to produce corrected lunar tables.

Observations of *magnetic declination, dip,* and *intensity* are made at all astronomical stations, and at many other points where it is desirable to know the declination for purposes of navigation. The instruments employed are similar to those used in the British magnetic surveys, being declinometers and horizontal force magnetometers on the plans of Gauss and Weber, Lloyd, and Lamont, by Jones of London, and dip-circles by Barrow and Gambey, provided with Lloyd needles for total intensity. In this manner not only the variation of the compass required for the mariner is obtained, but also contributions to our knowledge of the earth's magnetism, the value of which can hardly be appreciated as yet.

Observations on Heights.—The *heights* of the trigonometrical stations above the level of the sea are determined generally by observations of reciprocal zenith distances, frequently checked by direct levellings from the ocean. Interesting observations are in progress to compare results obtained by these methods with barometric and thermometric measurements of heights.

The Topographical Survey.—The *topographical survey* is executed with the plane-table on scales of $\frac{1}{5000}$, $\frac{1}{10000}$, and $\frac{1}{20000}$ of nature, according to the importance of the locality and the amount of detail to be represented. On the sheets drawn in the field the irregularities of the surface, hills, and depressions are indicated by horizontal curves, drawn at certain fixed vertical distances from each other. In the reduced drawing for the engraved charts, the spaces between these horizontals are filled up with *hashures,* the shade being darker in proportion to the steepness of the slope, according to a system somewhat modified from that of Lehman. Scales of shades showing the distance between the hashures, and the strength adapted to different scales of the maps, have been printed. The absence of very steep slopes and predominance of small ones rendered necessary the modification of the Lehman system.

The topographical survey is carried inland as far as required for purposes of navigation and the defence of the coast.

The Hydrographical Survey and Charts.—The *hydrography* is next in order. Soundings are taken with such frequency, as to exhibit the configuration of the bottom with sufficient minuteness for the purposes of navigation, the number of casts depending on the greater or less irregularity and slope of the bottom. The positions of the casts are determined in reference to the trigonometrical stations, generally by means of angles measured with the sextant at the place of sounding, and sometimes by the use of theodolites at two shore-stations; the latter especially in off-shore work, and in cases where great accuracy is desired. Great aid is also derived from the outlines of the topographical survey in fixing positions, as well as in determining the *lines of equal depth,* which are drawn on the charts for every fathom down to three or four fathoms.

The spaces contained within the several *fathom curves* are shaded by dotting, lighter shades corresponding to greater depths. The configuration of the bottom is thus graphically represented to the eye, and the direction and limits of channels are conveyed to the mind in a more rapid and comprehensive manner by mere inspection, than could be done by a close examination of the figures indicating the depths, which of course are also given.

Soundings.—The soundings extend from the shore and the head of tide-water generally, out to sea as far as soundings can be of use to navigators in determining their position. In this point of view, not only the depth, but also the character of the bottom, is of importance: the sounding-leads are provided with an apparatus to bring up a portion of the bottom, specimens of which are deposited in the archives of the Coast Survey. Microscopic examinations of some of the specimens from considerable depths have shown them to be crowded with organisms, the number and genera varying with the depth; and it is not impossible that science may here supply the mariner with another mode of determining his position at sea.

Discoveries by the Hydrographic Survey.—It is the hydrographical department of the survey that develops the results to which public attention are most directed, and which most immediately benefit the community. By the thorough system of hydrographic survey, new channels are discovered and hidden dangers are pointed out; the positions of many that are imperfectly known are determined with accuracy, and the proper positions for buoys, beacons, and lighthouses are indicated. Among the benefits thus conferred upon commerce, we may enumerate the discovery of a new channel, straighter and deeper than those before known, over the outer bars of New York harbour; of several channels into Delaware Bay, and of one inside the bay, often free from ice when the main channel is obstructed; of channels across the Cape Fear Shoals; of a new channel into Key West Harbour, and one of an increased depth, into Mobile Bay. The discovery and accurate delineation of Davis' Shoal and of Davis' Bank off Nantucket, and of other shoals in the vicinity, in the track of the commerce between New York and Europe, have been of the greatest value. Numerous harbours of refuge along the coast have been sounded out, and charts with sailing directions have been, for the first time, furnished to navigators.

Observations on Tides.—The subject of *tides* is receiving great attention, not only with reference to local tides and currents, but the general laws of the phenomena, both on the Atlantic and Pacific coasts, are under discussion. Extensive half-hourly observations of the tides have been made at a number of stations, extending over a time of from one to three years; at intermediate points, half-hourly observations during two lunations are found sufficient to exhibit the law and constants. Within a year or two past, self-registering tide-guages have been used with excellent success. Professor Bache personally engages in the discussion of this most interesting subject, and has made several communications to the American Association for the Advancement of Science, on the nature of these researches and their results, which will be found in their Transactions.

This subject is the more important, since the tides of the Atlantic, Pacific, and Mexican Gulf coasts of the United States present three distinct types; the diurnal tide, which is moderately large on the Atlantic coast, producing a perceptible diurnal inequality in height and time,—is very great on the Pacific,—and almost obliterates the the semi-diurnal tide in the Gulf of Mexico.

The direction and velocity of tidal currents, as important to navigators as the rise and fall of the water, are also observed with care. Tide and current tables on the charts embody the information thus obtained, and convey to the mariner all the knowledge he requires of the times, heights, and durations of tides, and the set and drift of currents.

Exploration of the Gulf Stream.—In connection with the hydrography, the present Superintendent has undertaken the *exploration of the Gulf Stream.* The plan of exploration is to determine the temperature and other physical circumstances, at different depths from the surface to the bottom, at positions on lines perpendicular to the axis of the stream, drawn from capes and headlands of the coast at suitable distances from each other. In this way various sections of the stream have been made, beginning north at Cape Cod in Massachusetts, and extending south to Cape Canaveral in Florida. The cold current between the coast and the Gulf Stream, the two branches into which the stream divides south of Hatteras, and the cold water between, and the ocean beyond to a sufficient distance from the warm water of the gulf, have been thus examined. On the section across the stream from Charleston, bottom was had at less than 500 fathoms in every cast, and a bank has been discovered and traced on the east side of the stream from the Charleston to the Canaveral section. This work is still in active progress, and it is much to be desired that the exploration eastward, from the American side of the northern part of the stream, should be met by a corresponding exploration from the shores of Great Britain westward, which would complete our knowledge of the Gulf Stream throughout its whole extent from the shores of Florida to those of Ireland.

Survey of the Pacific Coast of the United States.—Within a few years past the Pacific coast of the United States suddenly assumed a great importance in a commercial point of view. Its geography was very imperfect, and great inconvenience arose to navigators from the want of reliable charts. Professor Bache with great energy immediately extended the survey to that new region. The wants of commerce required a rapid survey of the whole extent of the coast, the geographical positions of the principal headlands, lines of sounding to show how near the land might be approached, and examinations of the entrances of harbours of commerce and refuge. The more elaborate and accurate, but necessarily slow, system which we have detailed must for a time be set aside, and reconnaissance work must take the place of the refined survey. The most necessary results were furnished to the world in a surprisingly short time. This is a field where discoveries are made at every step, and to enumerate them would be to rehearse the whole of the work done.

Reduction and Publication of the Observations by the Survey.—The results of the field-work are prepared for publication at the office of the Coast Survey in Washington city. The reductions of geodetic and astronomical observations are in the first instance made by the observers themselves, and a second computation is made independently by persons having no connection with the field-work. A strict scrutiny of the observations and perfect security against errors of computation is thus ensured, the two computations being examined and compared by an experienced person, who refers discrepancies which may occur to the Superintendent. The records of observations and computations are also put in form for publication.

The Annual Report of the Superintendent for 1851 contains a table of over 3000 geographical positions of trigonometrical points determined by the coast survey.

Execution and Publication of the Charts and Maps.—The original sheets, containing the topographical and hydrographical work, are combined and reduced to the scale of publication by regular draughtsmen in the office. The beauty and accuracy of these drawings can scarcely be surpassed.

The maps and charts are of three classes,—charts of harbours, maps of portions of the coast, and sketches of discoveries, &c. The scales of publication vary from $\frac{1}{10000}$ to $\frac{1}{400000}$, according to the detail to be represented.

The charts are engraved on copper by a corps of engravers in the office, among whom are some first-rate artists. When ready for publication, the plates are multiplied by the electrotype process; the originals are preserved in the archives, and the electrotype copies are used in printing. For an interesting description of the electrotyping process, as carried on at the office of the Coast Survey, see Appendix No. 55 of the Annual Report of the Superintendent for 1851. Large charts are sometimes engraved in two or four separate pieces, and then joined on a common electrotype plate; by this means great despatch may be effected, as several engravers can be engaged on the chart at the same time.

The prices at which the charts are sold are extremely low, ranging from fifteen cents to one dollar. They are freely distributed to all educational institutions, libraries, &c.

In conclusion it may be observed that the funds for carrying on the survey are voted annually by Congress, upon estimates submitted by the Superintendent, and the work above sketched out is executed in a manner as economical as it is accurate and comprehensive.

Exhibited Articles.—The following list embraces the contributions by the Bureau of the Coast Survey of the Treasury Department of the United States to the Exhibition in New York:—

Nos. 1. Base-line apparatus for laying down the base-line in geodetic trigonometry.
2. Astronomical transit instrument.
3. Astronomical zenith telescope.
4. Half-inch theodolite, for primary triangulations.
5. Heliostat.
6. Horizontal sectors for secondary triangulation.
7. Plane-table and metre-chain.
8. Sextants used in hydrography.
9. Steelwagen's sounding-lead, and specimens of ocean bottom.
10. Saxton's deep-sea thermometer.
11. Sphere crushed by the pressure of deep sea.
12. Sexton's reflecting pyrometer.
13. Electrotypes, comprising model plates, and their electrotype moulds and duplicates.
14. Electrotype copper, exhibiting great hardness, elasticity, and soundness.
15. Hydrographic and plane-table sheets.
16. Maps and charts of the United States' Coast Survey, and progress sketches.
17. Reductions for engravings.
18. Self-registering tide-guage.

Natural History Charts.—Besides the "Whale Charts," by Lieutenant Maury, to be noticed presently, a coloured map or chart, executed by James D. Dana, A.M., was exhibited, in which the geographical distribution of marine animals, especially that of the different species of crustacea, is explained. This chart, a work of great originality, gives in one view the results of multiplied observations. It accompanies a report by Mr. Dana, made to the Government of the United States, on the Crustacea collected during the Exploring Expedition under the command of Captain Wilkes, U. S. N., during the years 1838-1842.

The author has laid down on his map the isocrymal lines on the zones of greatest cold of the surface-waters of the ocean, in preference to the isothermals usually traced on maps descriptive of climate, since he finds that they are of higher importance in limiting the range of marine species. These isocrymal lines are not precisely those of any chart previously constructed, for they mark the positions where a given temperature constitutes the mean of the coldest month of the year,—for example a zone where the coldest thirty consecutive days may be 68° or 50° or 35°, Fahrenheit, or some other given temperature. The geographical distribution of marine life is stated to be a subject of far greater simplicity than that of continental life and the lines which bound the coral-reef seas and the range of certain mollusca and radiata coincide with those which govern the distribution of the crustacea. Hence the subdivision of the frigid, temperate, and torrid zones adopted in this chart have a direct bearing on the general advancement of our knowledge of the geography of marine life.

Maury's Charts.—In this department the "Wind and Current Charts," published by Lieutenant M. F. Maury, U. S. N., Superintendent of the National Observatory at Washington, occupy a prominent place, both as regards their usefulness and the novelty of the information which they convey. It was in 1842, that Lieut. Maury conceived the idea of requiring all the masters of American vessels to keep their log-books in an improved form, so as to exhibit, in addition to the ordinary information, records of all phenomena that could be rendered available for the improvement of hydrography and navigation, and generally for the promotion of science; and of employing the materials so recorded for constructing improved charts, to be engraved at the expense of Government, and distributed, free of cost, to those captains who supplied the data for their construction, or who sent to him what he terms "abstract logs." Lieutenant Maury applied to the United States Hydrographer, who entered warmly into the scheme; and circulars, addressed by the latter to all masters of vessels, were placed in the hands of the collectors of customs, who had instructions to give a copy to every captain at the time of clearance.

For some time this measure produced no fruit, but Lieutenant Maury persevered, and having obtained several old log-books from the Navy, and diligently studied and collated them, he discovered the existence of a shorter route to Rio; which discovery he publicly announced in 1848. Vessels which tried this new route reached the line, on an average, in nineteen days, whereas the same distance had previously taken them about forty days. The success of this experiment immediately caused the whole scheme to be regarded with favour,—abstract logs came in in abundance, and in 1853 more than 1000 masters of vessels were engaged night and day in making and recording the observations required; their logs are carried to the Observatory, where the information they contain is collated and entered on charts, and the results to the latest period are published in successive editions of Maury's "Sailing Directions." In some of the Wind and Current Charts the course of the trade-wind is laid down, as also the isothermal lines traversing the ocean.

Besides the charts by Lieutenant Maury already mentioned, others by the same author were exhibited, called "Whale Charts," in which the principal statistics of the whale fishery are given in the form of maps; especially the number of different species of large cetaceans found to occur in the ocean north and south of the equator.

Lord Wrottesley, in an able speech delivered in the British House of Peers (April 26, 1853), gave a full and clear explanation of Lieutenant Maury's plan for improving navigation and for promoting meteorological science. At the same time he earnestly advocated a proposal, previously made by the Royal Society of London, that the British Government should co-operate with the United States "by furnishing every ship under the control of the Admiralty with instruments properly constructed and compared, and with proper instructions for using them."

It is satisfactory to record that in the month of July, while the British Commissioners were yet in the United States, a meeting of the leading merchants of New York, representing more especially the shipping interest, took place, in which a public acknowledgment was made of the services rendered by Lieutenant Maury to his country. At the same time a valuable testimonial was voted to him, in proof of the high appreciation entertained of the results of his patient and skilfully directed labours.

At the Brussels Congress also, presently to be noticed, a vote of thanks was passed to Lieutenant Maury; and similar acknowledgments were subsequently made to him at public meetings of merchants and shipowners in London and Liverpool.

In August and September, 1853, a scientific congress was held at Brussels, to which the chief maritime nations of Europe sent delegates for the express purpose of consulting with the American hydrographer, and concerting with him a plan of combined operations, whereby the physical features and meteorology of the ocean might best be explored, and a record kept of scientific observations, calculated to promote the progress of navigation. The nations represented at the "Maritime Conference" were Belgium, Denmark, France, Great Britain, the Netherlands, Norway, Portugal, Russia, Sweden, and the United States. This meeting was convened at the suggestion of the American Government, consequent upon a proposition which it had previously made to the British Government, (in reply to a desire which had been expressed on the part of Great Britain that America should join in a uniform system of meteorological observation *on land,*) for extending Lieutenant Maury's plan of research. Although difficulties were at present found to exist with regard to the desired *uniformity* of the methods of observation *on land*, it was proposed that meteorological observations should be made by the military and mercantile marine, British and American, as well as by the mariners of all civilized nations, as far as possible, in a uniform manner over all navigated seas.

Meteorological observations* to a certain extent had long been made at sea, and Lieutenant Maury had turned to useful account such as had from time to time fallen into his hands; but these observations, although many of them good in themselves, were but isolated facts, deprived of much of their value from the absence of observations with which they could be compared, and above all from the want of a constant and uniform system of record, and from the rudeness of the instruments with which they had been made. The moment then appeared to him to have arrived when nations might be induced to combine in a general system of meteorological research. To use his own words, he was of opinion that "the navies of all maritime nations should co-operate, and make these observations in such a manner and with such means and implements, that the system might be uniform, and the observations made on board one public ship be readily referred to and compared with those made on board all other public ships, in whatever part of the world. And, moreover, as it is desirable to enlist the voluntary co-operation of the commercial marine, as well as that of the military of all nations, in this system of research, it becomes not only proper, but politic, that the forms of the abstract-log to be used, the description of the instruments to be employed, the things to be observed, with the manipulations of the instruments, and the methods and modes of observation, should be the joint work of the principal parties concerned."

The Conference opened its proceedings† at Brussels on the 23rd August, 1853, and was attended by twelve eminent meteorologists, hydrographers, and engineer officers, naval and military, selected by the respective Governments before mentioned. The United States were represented by Lieutenant Maury, the talented and indefatigable originator of this admirable scheme for improving navigation and advancing the progress of science; and M. Quetelet, the renowned Belgian meteorologist, presided at the meetings.

In concerting a plan of uniform observations for all nations, the Conference took into consideration the inconvenience arising from the variety of scales in use in different countries. After mature deliberation, no modification was recommended, except with regard to thermometers; it being agreed that the centigrade scale should be used in addition to the one employed, whether Fahrenheit or Réaumur, with a view to its ultimate general adoption.

The *accuracy* of the barometers and thermometers used, their comparison with standards, and the correct ascertainment of the errors of the instruments, were insisted upon. The mercurial barometer was preferred; and the attention of the public was directed to the *desideratum* of an economical marine barometer, that, at all times and in all weathers at sea, would afford the means of absolute and accurate determinations.

An anemometer also was considered necessary for the contemplated plan of research.

For the more complete observations, thermometers with dry, with wet, and with coloured bulbs are required. In addition to the implements above mentioned, and those generally used at sea, the only other instrument with which the Conference recommended the ships be provided was one of trifling cost, for obtaining the specific gravity of sea-waters.

The object of the Conference being to secure, as far as possible, uniformity of record, and such a disposition of the observations, that they would admit of ready comparison, a certain form of register was concerted and agreed upon. The first columns of this form will receive the data which the Government of the United States require merchant vessels to supply, in order to entitle them to the privileges of co-operators in this system of research, and may therefore be considered as the *minimum* of what is expected of them. This condition requires that at least the position of the vessel, and the set of the current, the height of the barometer, the temperature of the air and water, should each be determined once a-day; the force and direction of the wind three times a-day; and the observed variation of the needle occasionally. The register contains other columns that are intended for men-of-war to fill up, and for such officers in the mercantile navy as may be willing to distinguish themselves in this joint action for the mutual benefit of the services.

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* Maury's Sailing Directions, p. 55, 6th ed., January, 1854.

† Ibid., p. 54, &c.

A concise body of instructions for making certain observations and filling-up the columns of the register (or of the abstract-log, in the case of merchantmen) were drawn up by the Conference. The directions were limited to such only as seemed necessary to insure uniformity of observation.

The Conference also expressed a hope that whatever observations may be made will be turned to useful account without delay; and that, with this view, the several Governments will individually and mutually give their best attention to the means for perfecting the discussion and reduction of the observations obtained, and the interchange of materials and results.

General support of the plan of Universal Observation.—Lieutenant Maury has notified, that, with regard to the proposals that have emanated from the United States for a universal system of meteorological observation by sea and land, he has received assurances of approbation, support, and co-operation from very many sources, including scientific individuals and societies at Bombay, Calcutta, Mauritius, &c.; and in England and on the Continent; also from the Holy See, Sardinia, Holland, Prussia, Spain, Brazil, Peru, New Grenada, Chili, &c. With respect to the definite object of the Brussels Conference, namely, the adoption of a uniform system of observations by the marine of all maritime nation, the Report refers to the measures already taken by the Governments of Sweden and Norway, the Netherlands, Belgium, and Portugal, towards the establishment of a department for the object in view, and notifies that the Admiralty of Great Britain has expressed its intention of giving instructions for meteorological observations to be made throughout the Royal Navy.

Thus much we learn from Lieutenant Maury's published Report of the progress of the system so happily suggested by himself, and so warmly supported by various public and private coadjutors. With reference to the active part which the British Government is about to take in the furtherance of Lieutenant Maury's comprehensive and useful plan, it is arranged that a Parliamentary grant be made this year to the Board of Trade, *Department of Science and Art,* for carrying out the meteorological observations at sea, and for establishing an office for their discussion. This office will be located at Marlborough House, the officer in charge of it being a well-qualified captain in the Navy. By the co-operation of the departments of the Board of Trade, (that of Science and Art, and that of Mercantile Marine), ships will be provided with instruments at the public cost; these instruments being carefully compared with standards at the Kew Observatory, under the direction of the meteorological committee of the British Association, which has recommended the particular instruments that are to be used. Under these favourable auspices, and with the support of a widely spread and well-organized body of observers, actuated in their work both by public and private interests and by the love of science, Lieutenant Maury's noble plan for the study of oceanic meteorology, the benefit of navigation, and the general advancement of science, bids fair to fulfil the most sanguine hopes of its originator.

NEW YORK INDUSTRIAL EXHIBITION.

SPECIAL REPORT

OF

MR. DILKE.

Presented to the House of Lords by Command of Her Majesty.
1854.

LONDON:
PRINTED BY HARRISON AND SONS.

[1801]

MR. DILKE'S SPECIAL REPORT.

The circumstances stated in the General Report of the Commissioners as to the cause of my sudden recall from America will explain why the information I have collected is of so little importance. I had doubts indeed whether I ought to make a Report at all, but considering that I had undertaken that certain details connected with the Exhibition itself should be collected, and therefore that the other Commissioners had not directed their attention to this special subject, I have put together such facts as I could hurriedly collect, and have also ventured to place on record a few others in connection with the supply of water to towns in the United States—in regard to Limited Partnerships—to Industrial Educational Establishments—to the Smithsonian Institution—and to Fire Establishments, subjects on which I had intended to have obtained more extensive information had it been permitted to me to remain a longer time in the States.

I must not, however, omit to return my thanks for the kindness and courtesy shown to me by all classes in America with whom I was brought into communication—all were equally anxious not only to furnish information, but to obtain it for me if they did not possess the knowledge themselves.

For the Reports on Classes 8 and 10, I repeat I am entirely indebted to the kindness of Mr. W. Antrobus Holwell, Ordnance Storekeeper at Quebec, and Commissioner from Canada to the Exhibition at New York.

FORMATION OF THE ASSOCIATION FOR THE EXHIBITION OF THE INDUSTRY OF ALL NATIONS.

THE great success of the London Exhibition of 1851 stimulated some of the citizens of the United States, towards the end of that year and the beginning of 1852, to undertake an enterprise on the organization and issue of which I have now to report. For many reasons New York was fixed upon as the locality for the Exhibition, but especially from the facility of communication with Europe. The municipal authorities of the city responded promptly to the appeal of the projectors, and, on the 3rd of January, 1852, granted a lease, for five years, of Reservoir Square, as the ground for the building, upon two conditions; firstly, that the building should be of glass and iron; secondly, that no single entrance-fee should exceed fifty cents.

Upon application to the Legislature of the State of New York, a charter of incorporation was granted; the issue of stock being limited to three hundred thousand dollars. This limitation was subsequently extended to half a million of dollars. At the first meeting of the Board of Directors, held on the 17th of March, 1852, Theodore Sedgwick, Esq., was elected President, and William Whetten, Esq., Secretary. A detailed statement of the objects of the Association was issued, and the first two hundred thousand dollars were subscribed for, by about one hundred and fifty persons and firms.

Application was then made for the aid of the United States' Government at Washington, and Mr. Maxwell, Collector of the port of New York, was empowered to announce officially to the Association that the Exhibition building would be considered as a bonded warehouse, and that, consequently, all goods would be received into it duty free. The General Government, also, through its representatives in foreign countries, called for co-operation; which was zealously promised, not only by the authorities of those countries, but by their Ambassadors and Consuls, resident in America.

Mr. Charles Buschek, of London, was appointed by the Association agent for the negotiation of its foreign transactions.

Mr. C. E. Detmold having been chosen as superintending architect and engineer, Mr. Horatio Allen, as consulting engineer, and Mr. Edmund Hurry as consulting architect, the construction of the building was commenced.

The following is a list of the Officers and Board of Directors of the Association:

Officers.

THEODORE SEDGWICK, *President.*
WILLIAM WHETTEN, *Vice-President and Secretary.*
L. C. STUART, *Assistant Secretary.*
C. E. ANDERSON, *Treasurer.*

Board of Directors.

MORTIMER LIVINGSTON.
ALFRED PELL.
AUGUST BELMONT.
ALEXANDER HAMILTON, JR.
GEORGE L. SCHUYLER.
ELBERT J. ANDERSON.
HENRY R. DUNHAM.
W. C. H. WADDELL.
JACOB A. WESTERVELT.
JAMES A. HAMILTON.
SAMUEL NICOLSON.

PHILLIP BURROWES.
JOHNSTON LIVINGSTON.
CHARLES W. FOSTER.
THEODORE SEDGWICK.
WILLIAM W. STONE.
WILLIAM WHETTEN.
JOHN DUNHAM.
WILLIAM KENT.
WATTS SHERMAN.
F. W. EDMONDS.
J. J. ROOSEVELT.

THE BUILDING.

As soon as it became generally known that an American Exhibition, similar to that held in London, was projected, designs for an edifice were sent in. Amongst the most beautiful of these was one by Sir Joseph Paxton. Its merit was thoroughly appreciated by the Americans; but the peculiar shape of the plot of ground which it had now been decided should form the *locale* for the building was an insuperable objection to its adoption. Other plans of much beauty were submitted to the Association; but, either from the cause stated, above, or from their not being in consonance with one of the provisoes upon which the charter had been granted,—that the materials should be iron and glass —they were necessarily declined. Of these unaccepted designs may be named as worthy of special mention, those by Messrs. Bogardus and Hoppin, of the late Mr. A. J. Downing, and one by Mr. Leopold Eidlitz. The design ultimately adopted was by Messrs. Charles Gildermeister and George J. B. Carstensen; and a very ingenious and handsome architectural building is the result.

For a description of the building, I avail myself, with but slight alteration, of the following, from the " Illustrated Record of the Exhibition," published by Messrs. George P. Putnam and Co., New York:

" Reservoir Square, on which the building of the New York Industrial Exhibition is erected, lies in the north-western part of the city, four miles distant from the Battery, and three and a quarter from the City Hall, between the Sixth Avenue and the Croton Distributing Reservoir, whose massive walls overshadow its eastern side. The distance from the Reservoir to the Avenue is 445 feet; and the width from Fortieth-street in the south, to Forty-second-street, its northern limit, is 455 feet. This space is almost entirely occupied by the building. The shape of the ground is unfavourable for architectural purposes; and, aside from the facilities of access afforded by the Avenue Railways and numerous lines of stages, there is nothing to recommend this locality, while the solid and imposing strength of the Reservoir presents an inharmonious contrast with that light and graceful structure which we now proceed to describe.

" The appearance of the building, and the materials employed to construct it, show its relationship to the Crystal Palace of Hyde Park. Like that, its framework is a system of iron columns and girders; glass excludes the dull and heavy walls of masonry used in ordinary structures, and, with the slender proportions of the framing, give the edifice the light and airy appearance so well expressed by its popular name. The resemblance which we have spoken of is only a general one; the ground-plan, the relative proportion of each of the materials employed, and the details of construction, are quite different from its English prototype, and give it an architectural effect and character of its own.

" The general idea of the New York building is a Greek cross, surmounted by a dome at the intersection. . The length of each diameter of the cross is 365 feet and 5 inches, and the width of the arms is 149 feet and 5 inches. This does not include the three entrance-halls, projecting towards Sixth Avenue, Fortieth, and Forty-second-streets, which are each 27 feet wide, and approached by flights of steps. Although the edifice is cruciform, the outline of the ground-plan is nearly a regular octagon, whose diameter is the same as that of the arms of the cross. This form has been given to it by ingeniously filling up the triangular intervals between the arms of the cross with a lean-to of only one story, or twenty-four feet in height. The adoption of this device was necessary, in order to provide space for the Exhibition; it being impossible within the narrow limits of the site to enlarge the dimensions of the cross in the usual way; and while this substantial advantage is gained, it is productive of only a slight architectural defect in diminishing the perspective of the interior.

" The columns divide the interior into two principal avenues or naves, each 41 feet and 5 inches wide, with aisles 54 feet wide upon either side. The intersection of the naves leaves in the centre a free octagonal space, 100 feet in diameter. The columns still further subdivide the aisles and the triangular intervals between the arms of the cross, into square and half-square compartments of 27 feet on the side. The aisles are covered with galleries of their own width, and they are united to each other by broad connections at the extremities of the naves. The naves are carried above the roofs of the galleries to admit light, and are spanned by 16 semicircular arches of cast-iron, which are 40 feet and 9 inches in diameter, and placed at a distance of 27 feet from each other.

" The number of cast-iron columns upon the ground-floor is 190. They are 21 feet high above the floor, octagonal, and 8 inches in diameter; the thickness of the sides varies from half an inch to one inch. The girders are of cast-iron and wrought-iron—the longest of the first being 26 feet and 4 inches long, and the longest of the second, 40 feet and 9 inches long. The first tier of girders sustain the floors of the galleries, and brace the structure in all directions. They are united to the columns by connecting pieces 3 feet 4 inches high, which have the same octagonal shape as the columns, and flanges and lugs to be bolted together. The number of girders in the first tier is 252. The second story contains 148 columns, 17 feet and 7 inches high, which rest on those below them, and have the same shape. They receive a second series of girders, numbering 160, which support the roofs of the aisles. They also receive the semicircular arches of the naves. All the roofs are supported upon arches or upon girders, by means of wrought-iron inverted trusses, which receive the angle iron purlins of the rafter; the latter are made of strips of wood inclosed between iron sides. The roofs are uniformly constructed of boards, matched together and covered with tin.

" The dome, noble and beautiful in its proportions, is the chief architectural feature of the building. Its diameter is 100 feet, and its height to the springing line is nearly 70 feet, and to the crown of the arch 123 feet. It is supported by 24 columns which rise beyond the second story, and to a height of 62 feet above the principal floor. The system of wrought-iron trusses which connect them together at the top, and is supported by them, forms two concentric polygons, each of 16 sides. They receive a cast-iron bed-plate, to which the cast-iron shoes for the ribs of the dome are bolted. The latter are 32 in number. They are constructed of two curves of double angle-iron, securely connected together by trellis-work. The requisite steadiness is secured by tie-rods, which brace them both vertically and horizontally. At the top, the ribs are bolted to a horizontal ring of wrought and cast-iron, which has a diameter of 20 feet in the clear, and is surmounted by the lantern. As in the other roofs of the building, the dome is cased with match deal and tin sheathing. Light is communicated to the interior through the lantern, and also in part from the sides, which are pierced for thirty-two ornamental windows. These are glazed with stained glass, representing the arms of the Union and of its several States, and form no inconsiderable part of the interior decoration.

"The external walls of the building are constructed of cast-iron framing and panel-work, into which are inserted the sashes of the windows, and the louvers for ventilation. The glass is one-eighth of an inch thick, and was manufactured at the Jackson Glass Works, New York, and afterwards enamelled by Cooper and Belcher, of Camptown, New York. The enamel with which the whole of it is covered, is laid upon the glass with a brush, and, after drying, is subjected to the intense heat of a kiln, by which the coating is vitrified and rendered as durable as the glass itself. It produces an effect similar to that of ground glass, being translucent but not transparent.

"At each angle of the building there is an octagonal tower, 8 feet in diameter, and 76 feet in height. These contain winding stairways, which lead to the galleries and roofs, and are intended for the use of the officers and employées of the Association. Twelve broad staircases, one on either side of each entrance, and four beneath the dome, connect the principal floor with the gallery. The latter are circular in part, and consist of two flights of steps, with two landing-places. The flooring of the galleries is made of closely-matched planks, while those forming the floor of the first story are separated by narrow intervals, in the same manner and for the same purpose as in the London building. Over each of the principal entrance-halls, the galleries open upon balconies, which afford ample space for placing flowers, vases, and statues for decoration. Above the balconies, the ends of the naves are adorned with large fan-lights, corresponding to the semicircular arches within. On each side of the entrances there are ticket offices, and adjacent to them rooms are provided for the officers of the Association, telegraph, &c.

"The rapid and unexpected increase of the applications of exhibitors, induced the Association to erect a large addition to the building already described. It consists of two parts, of one and two stories respectively, and occupies the entire space between the main building and the Reservoir. Its length is 451 feet and 5 inches, and its extreme width is 75 feet. It is designed for the reception of machinery in motion, the cabinets of mining and mineralogy, and the refreshment rooms, with their necessary offices. The second story, which is nearly 450 feet long, 21 feet wide, and extends the whole length, is entirely devoted to the exhibition of pictures and statuary. It is lighted from a sky-light, 419 feet long, and 8 feet 6 inches wide."

The general outline and plan of the Building will be more readily comprehended by reference to the engravings, which accompany this Report. The first is a general view of the exterior, the second of the interior hall, showing the method adopted in its erection, and the third plate gives the plans of the ground floor and galleries.

The *decoration* of the Building under the direction of Henry Greenough, Esq., was very effective and pleasing. The exterior presents the appearance of a construction in bronze, whose ornamental portions are of gold. The interior was generally a cream-colour, relieved by a moderate use of the three positive colours, red, blue, and yellow. Nearly the whole of the decorations were in oil-paint.

The Building was supplied throughout with gas and water. The entire amount of iron used in its construction was 1,800 tons; 300 tons being wrought, and and 1,500 tons cast-iron. The quantity of glass was 15,000 panes, or 55,000 square feet. The quantity of wood, was 750,000 feet, broad measure.

Extract from the Report of the Directors on the

RECEIPTS AND EXPENDITURES OF THE ASSOCIATION,

From its Incorporation to the 1st of December, 1853.

RECEIPTS.

Capital Stock, $500,000, deducting 110 shares not issued, $11,000	$489,000	00
Sale of Tickets, Daily, Monthly, and Season, from 14th July to 30th November, inclusive	330,702	90
Refreshments	8,371	68
Sale of Catalogue, to 1st December, in part	2,832	60
Cash loaned by Directors	35,000	00
Cash advanced by Duncan, Sherman & Co.	18,805	82
Bills payable	6,357	72
Total	$891,070	72

EXPENDITURES.

Construction Account, including inside railing and outside fences in part, plumbing, outside awning, laying out grounds, boiler-house and store-house on 42nd and 43rd Streets		$533,708 45
Claim on City Government for Flagging		4,660 88
Fitting, Furnishing, and Decorations, including gas fixtures, counters and tables, flags and flag-staffs, office furniture, &c. &c.		101,172 84
Incidental Expenses :—		
Edward Riddle, purchase of Lease	10,000 00	
Charles Buschek, General Agent in Europe, including purchase of Amazon	20,000 00	
Charles Buschek—Resolution of Board	500 00	
„ „ sundry charges	1,079 74	
Colonel Hughes, Special European Agent	5,412 97	
Sundry travelling in the United States	1,831 17	
Seven Local Committees	3,651 98	
Foreign freight and marine insurance, paid under special agreement, for Exhibition of 1853	22,929 08	
Fire insurance	4,203 10	
Custom House department	6,286 59	
Receiving goods and Custom House charges, paid under special agreement, as above	2,619 10	
American freight	445 87	
Postage, before and since the opening of the Exhibition	764 80	
Office expenses, as well before as since the completion of the building	2,242 32	
Publicity, advertising, stationery, engraving	17,176 54	
General charges, including contributions to benevolent societies, imposed by charter	11,725 30	
Salaries, from May, 1852, to date of Statement	19,704 67	
Catalogue	8,462 70	
Jury department (to date of Statement)	736 59	
Design of Prize Medal	275 00	
Expenses and rent of room for meeting of Board and sundry Committees	560 00	
Interest—Duncan, Sherman & Co	3,217 12	
Discount	475 84	
Police, before 14th July	8,095 35	
		$152,395 83
Superintendence and Management of the Exhibition, including pay of police, wages in all the different departments, gas, &c., from 14th July to 1st December		99,132 72
[This includes a very considerable sum paid for wages before the opening, as it was necessary to employ many hands from the time that goods began to be received in the building.]		
Total		$891,070 72

C. E. ANDERSON, *Treasurer.*

It will be observed that the above statement is made out only to the 1st of December. Since that date the receipts have been, from all sources, to February 1st, 1854 .. .. 47,802 33

During that time the heating arrangements have been made, and various expenses incurred in regard to the Jury department, the foreign agency and the Exhibition of 1854, which considerably increases the debt of the Association as it appeared on the 1st of December. The present indebtedness of the Company, over and above all receipts, including all bills presented to this time, which are admitted or believed to be due, is $125,000 00

This is in part secured by mortgage on the Building.

It is apparent, from the foregoing statement, that the disappointment in regard to the financial results of the enterprise is due mainly to the fact of the Building not being completed at the time for which it was intended, viz. the 1st of May, 1853.

This was owing to causes over which the Directors had no control. The Exhibition was with great effort and difficulty got ready for opening on the 14th of July, and but then in a very incomplete state. Neither the machinery was set in motion nor the picture gallery opened till the 1st of September, and the season closed on the 1st of December, the Exhibitors then being entitled to permission to withdraw their goods. Instead, therefore, of a period of exhibition of seven months, the Association had in fact but about three : during that three months the sum received, from the sale of daily tickets, was $245,399 90.*

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* *Detail of Receipts from the Sale of Daily Tickets.*—The receipts were, for the month of

July, 14 days	$19,032 25
August, 27 days	45,000 75
September, 26 days	74,935 00
October, 26 days	108,139 01
November, 26 days	62,325 89
Total of 119 days	$309,432 90

The largest receipt on any day was Tuesday, the 18th October—$6,291 25.

If it had been opened in May, it is plain that the result would have been very different.

The delay of the opening also operated very injuriously upon the *expenditures.* As soon as the Building was ready to receive goods, it became the duty as it was the interest of the Association to make every exertion to relieve the Exhibitors, many of whom had been already waiting a long time; and, in consequence, a large amount of wages and of expense was incurred by the Association, which, in the regular state of things, would not have been necessary. It was indispensably requisite also to organize the police for some time before the doors were opened to the public, and this has always been one of the heaviest heads of expense.

The period from the 14th July to the 30th of November, is 119 working days. The above expenditure would make a daily charge of $833.05. But this is greatly beyond the proper or necessary expense of the Exhibition. During the recent season it was possible that the Association might have been considered as insurers of the goods against loss or theft, and an extraordinary expense for police was therefore incurred. From the 1st of December, all doubt on this point has been removed by the published circulars of the Association, and the police is now greatly reduced.

The present weekly expenses of the Establishment, including salaries, police, wages, stationery, advertising, fuel, rent, &c. are as follow :—

Weekly Expenses.

Salaries of Officers, &c.		$258 60
Pay-roll of hands employed in the building		800 00
Police		800 00
Petty Cash		25 00
Stationery		7 00
Jury department		7 00
Carpenters, &c...		10 00
Advertising and publishing		25 00
Cartage		7 00
Fuel, oil, &c.		150 00
Rents		50 00
		$2,139 60
Or, per day	$305 00	

PROPERTY OF THE ASSOCIATION.

This consists of the following items :—

Lease of Reservoir Square, from the Mayor, Aldermen, and Commonalty of the City of New York, from the 1st of January, 1852, to 1st January, 1857. Rent, one dollar per annum. On this ground the Association have erected their Exhibition Building.

Lease of Two Lots of Ground, 26 feet by 200, lying between 42nd Street and 43rd Streets, and the 5th and 6th Avenues, from 1st March, 1853, to 1st March, 1854, with privilege of renewal for from one to five years. Rent, one thousand dollars per annum. On this ground the Association have erected two buildings, as follows :—

1. *A Brick Boiler House,* 26 feet wide by 75 feet long. This building cost $2,065.97. The boilers placed in it for the Machinery in motion cost, with the setting, $4,733.34.

2. *A Brick Store House,* 125 feet long by 26 feet wide, and three stories high. The cost of this building was $5,180.

Statue of Kiss' Amazon, in zinc bronze, purchased of Mr. Buschek, in settlement with him, for $10,000.

Mineralogical Collection.—A large and very valuable portion of the Mineralogical Cabinet belongs to the Association. As the sum paid for it enters into the general expenses of the Mineralogical Department, it is not easy to estimate its exact cost.

The Exhibition Building, besides its permanent fixtures, contains a great deal of moveable property belonging to the Association, such as shafting and steam-pipe, for the machinery in motion, cost $5,847.05. 40 stoves, cost, with pipe and fixtures, $4,926.40. Counters, water tanks, hand trucks, and other smaller items. In addition to this, the Association was obliged to advance the cost of flagging 40th and 42nd Streets, and the 6th Avenue, around Reservoir Square, at an expense of $4,660.88, which there can be little doubt will be repaid by the City Government.

EXECUTIVE DEPARTMENT OF THE EXHIBITION.

The whole charge of the arrangements connected with the Building was, as the time for its opening approached, confided, by permission of the United States Government, to two officers of the United States' Navy, Captain S. F. Dupont, and Captain Charles H. Davis. These gentlemen appointed others in various departments, to carry out their views. The officers of the executive department, according to the latest published official list, were as follows:

CAPT. S. F. DUPONT, U. S. N., *General Superintendent.*
CAPT. CHARLES H. DAVIS, U. S. N., *Associate Superintendent.*
JOHN M. BATCHELDER, *Secretary to the Superintendents.*
GEORGE W. MATSELL, *Chief of Police.*
SAMUEL WEBBER, *Arrangement of Space and Classification.*
PROF. BENJ. SILLIMAN, JR., *Department of Mineralogy and Chemistry.*
JOSEPH E. HOLMES, *Director of Machinery.*
B. P. JOHNSON, *Director of Agricultural Implements.*
ANTONIO PIATTI, *Director of Sculpture.*
EDWARD VINCENT, *Director of Textile Fabrics.*
WILLIAM C. RICHARDS, *Editor of the Catalogue.*
G. P. PUTNAM & CO., *Publishers of the Official Catalogue and Record.*
JOHN F. TROW, *Printer of the Official Catalogue and Record.*

The Building and its contents were protected by a police force organized for the occasion. It consisted of a fine body of men, dressed in a semi-military style,—viz., dark-blue frock-coat and trousers, patent leather shoulder and body-belt, with pocket in the latter for bâton, and oil-skin cap lined with leather. The officers having their rank indicated by a slight difference of costume. I mention this as it was the first time in New York, and I believe in the United States, that any uniform had been adopted. The benefits derived from a uniformity of dress are known to all Englishmen, and would I think be soon appreciated by the citizens of the United States, whom I have often heard complain of the impossibility, in a crowd, of distinguishing the police, by the little rosette which is now worn on the breast.

The following official regulations were issued:

"1st. The members of the police are instructed to answer, in a *polite manner*, any questions put to them by visitors, but not to hold continued conversations, and to require visitors to move on when the passages are crowded. Visitors will please conform to this order.

"2nd. There are in the Building: Three U. S. Mail Boxes—a Boyd's Express Box*—an Office for Lost and Found Property and Children, Police Office—and Two Refreshment Rooms, with every convenience attached,—to which visitors will be directed by the Police, if desired.

"3rd. The Closing of the Exhibition for the day will be announced by the ringing of Bells.

"4th. The Exhibition will Open at 10 A.M., and Close at 10 P.M., through the Season.

"☞ Visitors will please leave Parasols, Umbrellas, Canes, &c., at the stands by each Main Entrance, receiving checks for the same.

"☞ No article can be removed from the Palace, without express permission, at the time, from the Superintendents' Office.

"☞ No FIRE or SMOKING allowed within the enclosure of the Grounds."

The plan of closing at 10 p.m. throughout the season was convenient for those engaged in business to a late hour: and the making it *compulsory* to leave umbrellas, canes, &c., at the entrance, was judicious.

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* Boyd's Express is a private undertaking in opposition to the Post Office arrangement, and seems to meet with general approval in the town of New York. The collection is made three times a-day from a great many stations, including nearly every hotel; and the letters are considered to be delivered with more regularity and rapidity than those intrusted to the Government Post Office, added to which the charge is less: the rate per letter sent by Boyd's Express being two cents, whilst the Government charge is three cents. The postage can be prepaid by stamps affixed, sheets of Boyd's stamps being obtainable everywhere.

INTERIOR ARRANGEMENTS OF THE BUILDING.

The objects exhibited were divided into the following classes:

Class 1. Minerals, Mining and Metallurgy, and Geological Mining Plans and Sections.

" 2. Chemical and Pharmaceutical Products and Processes.

" 3. Substances used as Food.

" 4. Vegetable and Animal Substances employed in Manufactures.

" 5. Machines for direct use, including Steam, Hydraulic, and Pneumatic Engines, and Railway and other Carriages.

" 6. Machinery and Tools for Manufacturing Purposes.

" 7. Civil Engineering, Architectural and Building Contrivances.

" 8. Naval Architecture, Military Engineering, Ordnance, Armour and Accoutrements.

" 9. Agricultural, Horticultural, and Dairy Implements and Machines.

" 10. Philosophical Instruments, and Products resulting from their use (*e. g.* Daguerreotypes, &c.), Maps and Charts, Horology, Surgical Instruments and Appliances.

" 11. Manufactures of Cotton.

" 12. " " Wool.

" 13. " " Silk.

" 14. " " Flax and Hemp.

" 15. Mixed Fabrics, Shawls, Vestings, &c.

" 16. Leathers, Furs, and Hair, and their Manufactures.

" 17. Paper and Stationery, Types, Printing and Bookbinding.

" 18. Dyed and Printed Fabrics, shown as such.

" 19. Tapestry, including Carpets and Floor Cloths, Lace, Embroidery, Trimmings, and Fancy Needlework.

" 20. Wearing Apparel.

" 21. Cutlery and Edge Tools.

" 22. Iron, Brass, Pewter, and General Hardware, including Lamps, Chandeliers, and Kitchen Furniture.

" 23. Work in Precious Metals and their Imitations, Jewellery and other personal ornaments, Bronzes, and articles of Vertû generally.

" 24. Glass Manufacture.

" 25. Porcelain and other Ceramic Manufactures.

" 26. Decorative Furniture and Upholstery, including Papier-maché, Paper Hangings, and Japanned Goods.

" 27. Manufactures in Marble, Slate, and other Ornamental Stones, Cement, &c., for Construction and Decoration.

" 28. Manufactures from Animal and Vegetable Substances, not woven or felted, or otherwise specified.

" 29. Miscellaneous Manufactures and Small Wares, Perfumery, Confectionery, Toys, Taxidermy, &c.

" 30. Musical Instruments.

" 31. Fine Arts, Sculpture, Paintings, Engravings, &c.

This, it will be seen, is, with little alteration, the same as the classification adopted in London, in 1851; the only change of importance being the assignment of *Musical Instruments* to a distinct class,—making, thus, 31, instead of 30 classes, and the admission of Paintings and Engravings to the Fine Art Department. Specimens of Caligraphy were also admitted.

The *position of the countries* in the Building cannot be very clearly described. The Building may be divided into four parts, each of which was subdivided into courts with galleries. The north-eastern quarter, on the ground floor and upper floor, was occupied by the United States; the south-eastern quarter, on both floors, by Great Britain and Ireland; the north-western quarter, on the ground floor, by United States, British Possessions, Holland, Italy, Denmark, Mexico, and Hayti; the south-western quarter, on the ground floor, by Germany, France, and Belgium. As a *general rule*, the upper floor of the two western quarters was occupied—as in the case of the two eastern quarters—by the same countries that were located in the corresponding space beneath; but there were exceptions. Switzerland occupied *only* gallery space over Holland, which had no space in the gallery; and Germany extended over Belgium, which also had no space in the gallery.

A table is appended, showing the number of exhibitors, of each country, in each of the thirty-one classes.

RETURN shewing the Number of Exhibitors in each of the Thirty-one Classes; the Foreign Countries being arranged in the order in which they stood in the Catalogue.

Country.	Class 1.	Class 2.	Class 3.	Class 4.	Class 5.	Class 6.	Class 7.	Class 8.
	Minerals, &c. &c.	Chemical Products.	Substances used as Food.	Substances used in Manufactures.	Machines for Direct Uses.	Machinery, Tools, &c.	Civil Engineering, &c.	Naval Architecture, Military Arms, &c.
1. Great Britain and Ireland	....	13	12	7	5	10	....	22
2. Zolverein and Germany	....	33	15	10	2	3	1	9
3. Belgium	....	2	1	2	1	2	....	4
4. France	....	16	22	19	2	11	2	5
5. Switzerland	....	1	....	2	....	1	....	2
6. Holland	....	7	6	18	4	1	1	....
7. Austria	....	6	1	8	....	....	....	4
8. Italy	....	12	9	5	....	2	1	....
9. British Possessions:—								
Canada	....	3	26	8	2	....	4	1
British Guiana	....	18	23	33	....	....	....	....
Newfoundland	....	....	5	4	....	....	....	1
Prince Edward's Island*	....	....	....	....	....	....	....	....
10. Denmark*	....	....	....	....	....	....	....	....
11. Sweden and Norway	1	....	1	1	1	....	....	....
12. Mexico*	....	....	....	....	....	....	....	....
13. Hayti*	....	....	....	....	....	....	....	....
14. Spain*	....	....	....	....	....	....	....	....
15. Portugal*	....	....	....	....	....	....	....	....
16. Russia*	....	....	....	....	....	....	....	....
17. Liberia*	....	....	....	....	....	....	....	....
18. Cuba*	....	....	....	....	....	....	....	....
19. Bermuda*....	....	....	....	....	....	....	....	....
Total of Foreign Countries	1	111	121	117	17	30	9	48
United States	....	57	97	61	United in Catalogue. 436 Carriages, Cl. 5, in addition 25		49	71
Grand Total	1	168	218	178	508		58	119

The contributions to Class 1, from all countries were mingled together in a separate apartment of the building and could not be arranged in time.

The Countries marked with an asterisk are set forth with the others in the Catalogue, but the contributions from them were so few and so unimportant that it was not deemed requisite to classify them.

RETURN shewing the Number of Exhibitors in each of the Thirty-one Classes, &c.—*continued.*

COUNTRY.	Class 9,	Class 10.	Class 11.	Class 12.	Class 13.	Class 14.	Class 15.	Class 16.
	Agricultural Implements, &c.	Philosophical Instruments and Products.	Manufactures of Cotton.	Manufactures of Wool.	Manufactures of Silk and Velvet.	Manufactures of Flax and Hemp.	Mixed Fabrics, Shawls, &c.	**Leather, Furs, and Hair.**
1. Great Britain and Ireland	9	22	9	12	11	22	6	13
2. Zolverein and Germany	3	37	8	56	18	8	22	25
3. Belgium	1	....	1	3	....	3	2	5
4. France	4	27	....	15	15	11	6	25
5. Switzerland	....	41	1	....	5	1	....	3
6. Holland	2	7	3	9	1	6	12	3
7. Austria	9	6	5	3	4	2	....	6
8. Italy	2	5	....	....	10	....		5
9. BRITISH POSSESSIONS:—								
Canada	5	2	....	12	....	6	10	9
British Guiana	....	....	....	....	....	....	....	....
Newfoundland	....	....	....	....	....	....	....	1
Prince Edward's Island	....	....	....	....	....	....	....	....
10. Denmark	....	....	....	....	....	....	....	....
11. Sweden and Norway	....	....	....	....	....	....	....	....
12. Mexico	....	....	....	....	....	....	....	....
13. Hayti	....	....	....	....	....	....	....	....
14. Spain	....	....	....	....	....	....	....	....
15. Portugal	....	....	....	....	....	....	....	....
16. Russia	....	....	....	....	....	....	....	....
17. Liberia	....	....	....	....	....	....	....	....
18. Cuba	....	....	....	....	....	....	....	....
19. Bermuda	....	....	....	....	....	....	....	....
Total of Foreign Countries	35	147	27	110	64	59	58	95
United States	111	182	33	26	7	8	9	58
GRAND TOTAL	146	329	60	136	71	67	67	153

COUNTRY.	Class 17.	Class 18.	Class 19.	Class 20.	Class 21.	Class 22.	Class 23.	Class 24.
	Papers, Stationery, Types, &c.	Dyed and Printed Fabrics.	Tapestry, Carpets, &c. &c.	Wearing Apparel.	Cutlery and Edge Tools.	Iron, Brass, Pewter, and General Hardware.	Works in Precious Metals, &c.	**Glass Manufactures.**
1. Great Britain and Ireland	27	2	35	9	18	40	17	7
2. Zolverein and Germany	35	1	33	32	6	66	11	10
3. Belgium	3	....	5	2	....	5	....	....
4. France	17	....	21	34	5	23	30	13
5. Switzerland	....	3	13	....	2	....	12	....
6. Holland	8	....	4	3	....	8	4	3
7. Austria	2	2	5	8	85	56	4	12
8. Italy	5	1	6	3	....	1	14	....
9. BRITISH POSSESSIONS:—								
Canada	....	....	10	20	1	6	....	....
British Guiana	....	....	....	....	....	....	....	....
Newfoundland	1	....	....	2	....	2	....	....
Prince Edward's Island	....	....	....	....	....	....	....	....
10. Denmark	....	....	....	....	....	....	....	....
11. Sweden and Norway	....	....	....	....	....	2	....	....
12. Mexico	....	....	....	....	....	....	....	....
13. Hayti	....	....	....	....	....	....	....	....
14. Spain	....	....	....	....	....	....	....	....
15. Portugal	....	....	....	..	....	....	....	....
16. Russia	....	....	....	....	....	....	....	....
17. Liberia	....	....	....	....	....	....	....	....
18. Cuba	....	....	....	....	....	....	....	....
19. Bermuda	....	....	....	....	....	....	....	....
Total of Foreign Countries	98	9	132	113	117	209	92	45
United States	60	10	57	93	42	101	48	17
GRAND TOTAL	158	19	189	206	159	310	140	62

RETURN shewing the Number of Exhibitors in each of the Thirty-one Classes, &c.—*continued.*

COUNTRY.	Class 25.	Class 26.	Class 27.	Class 28.	Class 29.	Class 30.	Class 31.
	Porcelain, &c. &c. Manufactures.	Decorative Furniture, Upholstery, &c.	Manufactures of Marble, Slate, &c.	Manufactures from Animal and Vegetable Substances.	Small Wares, Perfumery, Toys, &c.	Musical Instruments.	Sculpture, Paintings, Engravings, &c.
1. Great Britain and Ireland	22	15	5	9	29	3	65
2. Zolverein and Germany	12	23	2	34	73	19	21
3. Belgium	....	....	2	2	1	1	7
4. France	8	13	2	4	30	7	22
5. Switzerland	1	2	....	10	2	2	3
6. Holland	....	9	5	4	8	1	19
7. Austria	3	2	8	3	13	5	54
8. Italy	1	14	14	16	6	1	87
9. BRITISH POSSESSIONS:—							
Canada	2	1	1	4	7	1	11
British Guiana	....	2	....	16	6	....	....
Newfoundland	....	....	2	....	2	....	....
Prince Edward's Island....	....	....	....	....	....	....	....
10. Denmark	....	....	....	....	....	....	....
11. Sweden and Norway	....	....	....	3	1	1	....
12. Mexico	....	....	....	....	....	....	....
13. Hayti	....	....	....	....	....	....	....
14. Spain	....	....	....	....	....	....	....
15. Portugal	....	....	....	....	....	....	....
16. Russia	....	....	....	....	....	....	....
17. Liberia	....	....	....	....	....	....	....
18. Cuba	....	....	....	....	....	....	....
19. Bermuda	....	....	....	....	....	....	....
Total of Foreign Countries...	49	81	41	105	178	41	289
United States	8	101	34	36	134	41	101
GRAND TOTAL	57	182	75	141	312	82	390

In considering the subject of prizes, the Committee of Management adopted a different course to that pursued at the Great Exhibition in 1851. They divided the jurors into seventeen classes.

Jury A. Class 1—Dealt with Minerals, Mining, Metallurgy, and Geological and Mining Plans and Sections.

Jury B. Comprising Classes 2-4 and parts of Classes 10-18-24 and 25.—Chemical and Pharmaceutical Products and Processes, Vegetable and Animal Substances employed in Manufactures; Chemical and Pharmaceutical Apparatus; Dyed and Printed Fabrics, shown as such; Chemical Utensils made in Glass Stoneware and Hard Porcelain.

Jury C. Comprising Classes 3 and 9.—Substances used as Food; Agricultural, Horticultural, and Dairy Implements and Machines.

Jury D. Classes 5-6 and 7.—Machines for direct use, including Steam Hydraulic and Pneumatic Engines, and Railway and other Carriages, Machinery and Tools for Manufacturing Purposes, Civil Engineering, Architectural and Building contrivances.

Jury E. Class 8.—Naval Architecture, Military Engineering, Ordnance, Armour and Accoutrements.

Jury F. Part of Class 10. Class 10a-10b.—Philosophical Instruments and Products resulting from their use; Daguereotypes, Maps and Charts, Horology, Surgical Instruments and appliances.

Jury G. Classes 11-12-13-14 and 15.—Manufactures of Cotton, Wool, Silk, Flax and Hemp, Mixed Fabrics, Shawls, Vestings, &c.

Jury H. Classes 16 and 20.—Leather, Furs and Hair, and their Manufactures; Gentlemen's Wearing Apparel.

Jury I. Part of Class 19 and Class 26.—Tapestry, Decorative Furniture and Upholstery, including Papier-maché, Paper Hangings and Japanned Goods; Marble Ornaments and Marbleized Irons.

Jury I*a*. Part of Class 19 and Class 20.—Lace, Sewed and Tamboured Muslins, Embroidery, Fringes, Fancy and Industrial Works, and Female Wearing Apparel.

Jury J. Classes 21 and 22.—Cutlery and Edge Tools, Iron, Brass, Pewter, and General Hardware, including Lamps, Chandeliers and Kitchen Furniture.

Jury K. Classes 28 and 29.—Manufacturers from Animal and Vegetable Substances not woven, felted or otherwise specified; Miscellaneous manufactures and small wares, Confectionery, Toys, Taxidermy, &c.

Jury L. Class 23.—Works in precious Metals and their imitations; Jewellery and other personal Ornaments, except Bronze and articles of Vertu, which were transferred to the action of Jury O.

Sub-jury L. Part of Classes 24 and 25.—Glass Manufacture, Porcelain, and other Ceramic manufactures.

Jury M. Class 30.—Musical Instruments.

Jury N. Class 17.—Paper and Stationery, Types, Printing and Bookbinding, and specimens of Ornamental Penmanship.

Jury O. Class 31.—Fine Arts, Sculpture, Painting, Engravings, &c., Bronzes and articles of Vertu from Class 23.

The following is the return of awards, as made by the Jurors whose names appear attached to each group:

COPY OF THE OFFICIAL AWARDS OF THE JURIES.

Commissioners on Juries.

PROFESSOR B. SILLIMAN, Jr.
B. P. JOHNSON, Esq.
SAMUEL WEBBER, Esq.

Secretary.

EDWARD LEAVENWORTH, Esq.

Jury A.

Class 1.—Minerals, Mining, Metallurgy, and Geological and Mining Plans and Sections.

Jurors.

Prof. JAMES D. DANA, Chairman.
Prof. JAMES HALL.
WM. C. REDFIELD, Esq.
GEORGE SUMNER, Esq.

Silver Medals.

De La Beche, Sir Henry, C.B., London, Geological Maps, Plans, and Sections.

Royal Saxon Mining College, Freiberg, Saxony, collection of Ores, Silver, Lead, Antimony, &c.

Royal Bavarian Directory of Mines, Munich, Bavaria, collection of Ores, Minerals, &c.

Wheatley Charles M., Phœnixville, Penn., collection of Lead Ores from Wheatley Mines; Copper Ores, Morris Mine; with Maps and Mining Plans, Drawings of the Engines used, &c.

Bronze Medals.

Brandon Iron and Car Wheel Co., J. Howe, Jr., Agent, Brandon, Vermont, collection of Iron and Manganese Ores, Pig Iron, Lignite, Clay Ochres, with special commendation.

Blackstone Coal Mining Company, E. N. Clark, Agent, Valley Falls, Rhode Island, Anthracite Coal and Coal Plants.

Budlong & Stoughton, New York City, Marble from Chazy, New York.

Citizens of Wilkesbarre, Pennsylvania, one Column of Coal and huge masses from mines in vicinity.

Lonaconing Coal Company, George's Creek, Maryland, Column of Bituminous Coal.

Mount Savage Iron Company, Alleghany Co., Maryland, Fossiliferous and Hematite Iron Ores, Bituminous Coal, Coke, Cinder, Pig Iron, Slag, &c.

Parker Vein Coal Company, Mass of Coal from Parker Vein, Maryland.

Pictou Mine, Nova Scotia, Coal illustrating veins.

Richardson, Barnum & Co., Salisbury, Connecticut, Hematite Iron Ores, Pig Iron, Flux, Slag, &c.

Sydney Mines, Nova Scotia, Coal illustrating veins.

Ulster Mining Co., T. H. Butterworth, Secretary, New York City, Galena and Copper Pyrites, with samples of Dressed Ores, &c., from the Ulster Mine, Elenville, N. Y.

Webb, George, H., Malone, Franklin Co., New York, Drab coloured and Brown Stone, from the Potsdam Sand Stone, N. Y.

Honourable Mention.

Adams & Co., New York City, Gold Nuggets from California and Australia, Crystalized Gold in Quartz, and Specimens of Gold from more than 200 washings.

American Mining Company, New York City, collection of Copper Ores from various Mines.

Canfield, Robbins & Co., Fall Village, Connecticut, Iron Ores, and Iron in various stages of Manufacture.

Cornwall Iron Company, West Cornwall, Connecticut, Salisbury Iron Ore, Pig Iron, Flux and Slag.

Dorn, W. B., Oakland Grove, Edgefield District, South Carolina, Native Gold, and Gold in Quartz.

Ehlers, John, Weehawken, New Jersey, collection of Silver Ores from the various Mines in Mexico.

Gilliss, S. M., Lieut. U. S. N., Chilian Silver Ores.

Hall, Coppy, & Sloane, Florence, Tuscany, Copper Ores and associate rock, with Cake Copper, from Monte Catini, near Volterra, Tuscany.

King, R. A., Lexington, Davidson Co, North Carolina, Specimens of Galena, Carbonate of Lead, Silver Ore, Bar Silver, &c.

Lane, A. A., New York City, Black Oxyd of Manganese, from Edgefield District, South Carolina.

Minesota Mining Company, Lake Superior, Native Copper.

North Carolina Copper Company, Guildford Co., North Carolina, Yellow Copper Ore.

New York & Michigan Mining Company, Lake Superior, Native Copper.

Oakley, Richard, New York City, Cannel Coal, Little Coal River, Virginia.

Patapsco Cobalt & Copper Co., Frinksburg, Maryland, Mass Yellow Copper Ore and Specimens of Cobalt Ores.

Pennsylvania—*To the following Exhibitors of Iron Ores, Fluxes, Slags, &c.. collected by Doctor Charles M. Wetherill, Philadelphia, for the Association:*

Hematite Iron Ore, Pig Iron, Flux, and Slags; Mount Laurel Furnace. Berks County, Clymer & Co.

Hematite Ore, Pig, Flux, and Slag; Moslem Furnace, Berks County, N. V. R. Hunter.

Hematite Iron Ore, Pig, Flux, and Slag; Carbon Furnace, Mauch Chunk, Carbon, Richards & Sons.

Black, Grey, and Red Iron Ore, Pig, Flux, and Slag; East Pennsylvania and Lehigh Furnaces, Lehigh County, S. Balliet & Co.

Pipe and Hematite Iron Ores, Pig, Flux, and Slag; Lehigh Crane Iron Company, Catasuqua, Lehigh County.

Hematite Iron Ore, Coal, Pig, Flux, and Slag; Allentown Furnace, Lehigh County, D. E. Wilson & Co.

Magnetic, Micaceous, and Hematite Iron Ores; Copper Ores from various Pennsylvania localities; E. & G. Brooke, Birdsboro', Berks County.

Magnetic Oxyd of Iron; Warwick Mines, St. Mary's, Chester County.

Octahedral Magnetic Oxyd Iron, Copper Pyrites, Carbonate of Copper, Carbonate of Magnesia, and Serpentine; Jones's Mine, Berks County.

Octahedral Magnetic Iron Ore, Quartz, Feldspar, &c; Elizabeth Mine, near Knauertown, Chester County

Magnetic Oxyd Iron, Pig, Flux, and Slag; Hopewell Furnace, Berks Co., Brooke, Buckley & Co.

Magnetic Oxyd Iron; Hopewell Mine, Chester County.

Magnetic Oxyd of Iron, Pig, Flux, and Slag; Joanna Furnace, Berks Co., Darling & Smith.

Magnetic Oxyd Iron, with Zircon and Allanite, Pig, Coal, Flux and Slag; Henry Clay Furnace, Reading, Eckert & Brother.

Rifle Barrels, in various stages of Manufacture; Colonel John H. Keim, Reading.

Hematite and Magnetic Iron Ore, Clay, Serpentine, Garnets, Molybdenite, Sulphate of Strontia, &c.; George M. Keim, Reading.

Red Shale, Coal, Iron Ores, &c.; P. W. Sheafer, Pottsville.

Schuylkill County Coals, collected by C. W. Peale and Colonel J. M. Wetherill, Pottsville, and purchased by the Association.

Fossiliferous Oxyd of Iron, Coal, Pig, Slag, and Flux; Iron Dale Furnace, Columbia County, Bloomsburg Iron Company.

Iron Ores, Pig, Flux, and Coal; Chulasky Furnace, Red Point, Northumberland County, Samuel R. Wood.

Fossiliferous and Slaty Iron Ore, Pig, Flux, and Slag; Mountain Iron Company, Danville.

Argillaceous Iron Ore, Pig, Flux, and Slag; Ralston and the Lycoming Valley Iron Works, Astonville, Lycoming County.

Hematite Iron Ore, Flux; Mill Hall Furnace, Clinton County, Wharton, Miller & Company.

Pipe Iron Ore, Pig, Flux, and Slag; Logan Furnace, Bellefonte, Centre County, Valentine & Thomas.

Pipe Ore, Needle Ore, Pig, Flux, and Slag; Eagle Works below Bellefonte, Centre County, C. & J. Curtis.

Coal, Rocklabin Coal Company, Grindstone, Ross Ore; J. D. Pettriken, Bellefonte, Clinton County.

Hematite, Fossiliferous Iron Ore, Pig, Flux, Slag, Howard Iron Works, Centre County, Irwin, Thomas & Co.; Agents, E. J. Etting & Brother, Philadelphia, Pennsylvania.

Pipe Iron Ore, Hematite Ore, Pig, Flux, Slag, Pennsylvania Furnace, Huntingdon County, Lyon, Short & Co.

Hematite Iron Ore, Pig, Flux, Slag, Huntingdon Furnace, Warriors' Mark, Huntingdon County, George R. Schoenburger.

Argillaceous Iron Ore, Pig, Flux, Slag, Johnston Furnace, Cambrian County, Ray, Mathews & Co.

Iron Ores, Pig, Flux, Sandstone, Cement, Coke, Coal, Slag, Cambria Iron Company, Johnstown, Cambria County.

Shell and Kidney Iron Ore, Flux, Slag, Black Lick Furnace, Indiana County, Cambria Iron Company.

Shell Iron Ore, Pig, Flux, and Slag, Mill Creek Furnace, Cambria County, Cambria Iron Company.

Shell and Kidney Iron Ore, Pig, Flux, Slag, Beir's Creek Furnace, Cambria County, Cambria Iron Company.

Pipe Iron Ore, Flux, Cadmia, Alleghany Furnace, Indiana County, Elias Baker.

Argillaceous Iron Ore, Coal, Pig, Iron, Flux, Slag, Fairchance Iron Works, Fayette County, F. H. Oliphant & Son.

Hematite Iron Ore, Pig, Flux, Slag, Springfield Furnace, Blair County, D. Good & Co.

Argillaceous Iron Ore, Pig, Coal, Flux, Slag, Winfield Furnace, Butler County, Wm. L. Spear.

Magnetic Oxyd and Hematite Iron Ore, Coal, Pig, Hearthstone, Flux, Slag, Harrisburg Furnace, Harrisburg, Dauphin County, Gov. D. R. Porter.

Chesnut Hill, Iron Ore, Pig, Coal, Flux, Slag, Henry Clay Furnace, Columbia, Lancaster County, Haldeman & Small.

Chesnut Hill Hematite Iron Ore, Magnetic Iron Ore, Coal, Pig, Flux, Slag, Chickiswalunga Furnace, Columbia, Lancaster County, Dr. E. Haldeman & Co.

Chesnut Hill Ore, Pig, Donegal Furnace, Columbia, Lancaster County, Eckert and Stein.

Hematite Iron Ore, Pig, Marietta Furnace, Marietta, Lancaster County, Schoenburger, Musselman and Co.

Brown Hematite Iron Ore, Pig, Flux, Slag, Conowingo Furnace, Lancaster County, Jas. M. Hopkins.

Hematite Iron Ore, Wyoming Valley Coals, Zinc Ore, Lead Ore, Copper Ore, Flux, Bar Iron, Safe Harbour Iron Works, Lancaster County, Reeves, Abbott and Co.

Hematite Magnetic Iron Ore, Coal Pig, Flux, Slag, Phœnixville Iron Works, Chester County, Reeves, Buck and Co.

Hematite Iron Ore, Pig, Coal, Flux, Slag, Spring Mill Furnace, Montgomery County, David Reeves.

Hematite Pipe Iron Ore, Pig, Flux, Slag, Plymouth and Merions Furnaces, Consbohocken, Montgomery County, S. Colwell and Co.

Hematite Magnetic Iron Ore, Coal, Pig, Flux, Slag, Swede Iron Company, Montgomery County.

Limestone, Kidney Iron Ore, Pig, Coal, Flux, Slag, Pike Furnace, Pike County, Duff and Co.

Rogers Charles H. and Co., New York City, Mass of Galena, with Cubic Crystals, from Galena, Illinois.

State of Michigan, a Mass of Native Copper, weighing 6,300 pounds, from the Mines of the North American Mining Company, Lake Superior.

Sage H., Lakeville, Connecticut, Iron Ore, Pig Iron, Flux and Slag.

Ward Brothers, New York City, Silver Ore and Bars of Silver from Prince's Bay: Native Copper from Toltec Mine, Lake Superior.

West Virginia Cannel Coal Co., W. H. Post, Secretary, New York City, Cannel Coal from Virginia.

JURY B.

Classes 2, 4, part of Classes 10, 18, 24, 25.—Chemical and Pharmaceutical Products and Processes, Vegetable and Animal Substances employed in Manufactures; Chemical and Pharmaceutical Apparatus; Dyed and Printed Fabrics, shown as such; Chemical Utensils made in Glass, Stoneware, and Hard Porcelain.

Jurors.

PROF. JOHN TORREY, M.D., Chairman.
H. PLANTEN, Esq., Deputy.

J. H. CURRIE, Esq..
DR. B. W. McCREADY.
F. L. TALCOTT, Esq.
H. D. TELKAMPF, Esq.

ALEXANDER OAKLEY, Esq.
DR. DAVID A. WELLS.
DR. J. BRYANT SMITH, Acting Sec.

Silver Medal.

BATCHELOR, J. M., Gulf Hills, Miss., U.S., for Cotton of staple and best working quality.

DEDOVICH VON LANG, Oels, Silesia, for the finest specimen of Wool in German Department.

GRAUX, J. L., Mauchamp, France, for superior specimen of Combing Wool.

HOFFMAN, ANTHONY, Pine Plains, New York, for the finest specimen of Wool in the U. S. Department.

LARDEREL, COUNT DE, Florence, for Boracic Acid.

POPE, JOHN, the Oaks, Tennessee, U.S., for Cotton of Staple and best working quality.

Bronze Medal and Special Mention.

GEHE and Co., Dresden, Saxony, for series of Mineral, Vegetable and Animal Productions.

HELMAN, W. H., New York City, U.S., for Bronze Powder and Metal Leaf.

LYLES, POLHEMUS and Co., New York, for specimens of Oils, Spermaceti, Sperm and patent Candles.

MERCK E., Darmstadt, Prussia, for specimens of Alkaloids.

PHALON, E., New York City, U.S., for Cologne Fountain, Choice Extracts, &c.

PHOENIX MANFG, County Taunton, Massachusetts, U.S., for Black Lead Crucibles, and Stove polish.

RIMMEL, EUGENE, London, Great Britain, for Perfumery and Soaps.

Bronze Medal.

BIRKNER and **HARTMANN**, Nürnberg, Germany, for Bronzes and Leaf Metal.

BAZIN, XAVIER, Philadelphia, U.S., for specimens of fine Toilet Soaps and Perfumery.

BECK and Co., Boston, Mass., U.S., for Babbitt's Toilet Soaps, Shaving Creams, &c.

BRANDON, N. D., Amsterdam, Holland, for Stearine Candles and Tapers, Lime Soap and Stearic Acid.

BATKA, WENZEL, Prague, Bohemia, for various Chemical and Pharmaceutical productions, and for Chemical and Pharmaceutical instruments.

BUCHNER, WM., Darmstadt, for Ultramarine, with special approbation.

BONZEL FRERES, Haubordin, Ultramarine, with special approbation.

COLGATE, WILLIAM and Co., New York City, U.S., specimens of fancy Soaps, also for fine Starch from Indian corn.

CLEAVER, FREDERIC S., London, England, for Honey, Toilet, and other Soaps.

CURTIUS, JULIUS, Duisburg, for Ultramarine.

DES BROSSES, FREDERIC Manhattanville, U.S., for patent distilled Chemical Sperm Candles.

ESTIVANT and **PARENT**, Givet, France, for Glue.

FRIES, C. A., Heidelberg, for Ultramarine, with special approbation.

GUIMET, J. B., Lyons, France, Ultramarine.

GODIN, M., ainé, Chatillon, Dep. Seine, France, for specimens of Merino Combing Wool.

GERARDI, MARTINI, Turin, Sardinia, for Specimens of Vegetable Oils.

GRESSLER, E., Erfurt, Germany, for Chemical and Physical Apparatus.

HERMANN, O., Schœnbeck, Germany, for collection of Chemicals.

HASKELL, MERRICK and **BULL**, New York City, U.S., for specimens of Powdered Drugs.

HUSBAND, THOMAS J., Philadelphia, U.S., for Calcined Magnesia.

HOLMES, JOSEPH E., U.S., for 129 specimens of American Woods.

JUDD, SAMUEL and **SONS**, New York City, U.S., for specimens of Spermaceti and Patent Candles.

KENT, JAMES H., Bury St. Edmunds, Great Britain, for Dried Preparations of British Plants, Fluid Extracts, &c.

KOHNSTAMM, JOSEPH, New York City, U.S., for specimens of Ultramarine for Calico Printing, and other Colours for Painting, Printing, &c.

KOHNSTAMM, Widow, Niederweren, Germany, for specimens of Ultramarine, with special approbation.

LOEBBECKER and Co., Breslau, Germany, for specimens of Zinc White.

LITCHFIELD and Co., New York City, for specimens of Spermaceti, Sperm Candles, Oils, &c.

LYON, E., New York City, U.S., for Magnetic Powder, for destruction of insects. vermin, &c., without poison.

MENIER and Co., Paris, France, for various Drugs and Extracts.

MARTIN, ABBES M.C., Cologne, for Cologne Water and Carmelite Spirit of Melissa.

NIX, ARTHUR, McComb's Dam, New York City, U.S., for specimens of Fine Sun Bleached Wax from the ordinary American Yellow Wax.

NAILER, JEFFERSON, WARREN and Co., Jefferson County, Mississippi, U.S., for specimen of cotton of superior colour and handling.

NOMEN, A. M., Genneken, Netherlands, for Oil Seed Cakes, Glues, Oils, &c.

PRINS and Co., Wormerveer, Holland, for Urling's patent Starch.

PAYSON, IRA F., Stapleton, New York, U.S., for specimens of a new and patent variety of Soap.

PERSELAER AND SON, Maestricht, Netherlands, for Odoriferous Soaps, Candles, &c.

POWERS and **WEIGHTMAN**, Philadelphia, U.S., for a fine assortment of Chemicals.

PFIZER, CHARLES, AND Co., New York City, U.S., for Refined Camphor, Kreosote, &c.

ROSENGARTEN AND DENIS, Philadelphia, U.S., for Sulphate of Quinine, Veratrine, &c.

SMITH, THOMAS AND HENRY, Edinburgh, Great Britain, for specimens of Aloine and Caffeine.

SCHOLS, FREDERICK. New York City, U.S., for specimens Mass and Roll Brimstone.

SPEAR, BURKE, AND Co., Boston, U.S., for Starch from Potatoes.

STEINBACH, JAMES, JR., Petit Quevilly, France, for Starch, Fecula, and Gums.

TILDEN AND Co., New York City, U.S., for Medicinal Extracts prepared in Vacuo.

TAYLOR AND SON, Chelsea, England, for Soaps and Perfumery.

TAYLOR, H. P. AND W. C., Philadelphia, U.S., for Transparent and Fancy Soaps.

WOTHERSPOON, ROBT., Maxwellton House, Scotland, for Starch from East India Sago.

WOOD, THOMAS, Smithfield, New York, U.S., for specimen of Wool.

Not in Catalogue.

SWEDEN AND NORWAY, for Commercial Nickel, entirely free from arsenic, from the Klapa Mines, certified by Berzelius.

CLASS 2.—The New Jersey Zinc Company. For a good assortment of Zinc Paints.

Honourable Mention.

ALTER AND GILLESPIE, Freeport, Pa., U.S., for Bromine.

ASHARD BROS., New York City, U.S., for Patent Perfumed Oriental Crystals.

ALBANI BROS., Turin, Sardinia, for a variety of Chemical Productions.

ARNAVON, HONORE, Marseilles, France, for various kinds of Soaps.

ADAM, J. N. Reinweig, Bavaria, Ultramarine.

BLANCARD, H., Paris, France, specimens of unalterable Pills of Iodide of Iron.

BONZEL, BROS., Haubordin, France, samples of Ultramarine and Azure Blue.

BREWSTER, SAMUEL, C., Geddes, U.S., for specimens of Solar Coarse Salt.

BURCKHART AND Co., Cincinnati, U.S., for superior Lard Oil.

BLAKE, WILLIAM, New York City, U.S., for Patent Fire and Weatherproof Paint, and Artificial Slates manufactured from the same.

BENDA, GEORGE, Fürth, Bavaria, for Bronze Colours.

Brandeis, J., Jr., Fürth, Bavaria, for Bronze Colours and Powders.

Bo, Augustus, Turin, Sardinia, for samples of Chrome Yellow and other Colours.

Bully, Jean Vincent, Paris, for specimens of Aromatic Vinegar.

Brasseur, Eugene, Ghent, Belgium, for samples of Ultramarine Blues and White Lead.

Claude, Louis, Brussels, Belgium, for Rape Oil purified for Burning.

Cercuil, L. F., Paris, France, for Colours for Paper Hangings.

Cookson, W. J. and Co., London, Great Britain, for specimens of Antimony, Red Lead, &c.

Christani Richard S., Philadelphia, U.S., for specimens of Perfumery.

Dehmel, Heinrich, Quaritz, Lower Silesia, for Toilet Soaps in fancy designs.

Dixon, J. and Co., Jersey City, U.S., for Black Lead Crucibles, Furnaces, &c.

Delluc and Co., New York City, U.S., for Flavouring Extracts.

Dupuy, E., New York City, U.S., for Concentrated Extract of Lemon and Vanilla.

Electoral Hesse Smalt Works, Schwarzenfels, for Collection of Colours.

Ellis, Charles, and Co., Philadelphia, U.S., for an assortment of Medicinal Preparations.

Electoral Hesse Smalt Works, Schwarzenfels, Ultramarine.

Fabre, Repetto Pietro, Porto Maurizio, Sardinia, for Fine Bar Soap.

Farina, J. Maria, opposite George Platz, Cologne, for Cologne Water.

Farina, J. Maria, opposite New Market Platz, Cologne, for Cologne Water.

Farina, J. Maria, opposite Martin's Platz, Cologne, for Cologne Water.

Farina, J. Maria, opposite Jülich's Platz, Cologne, for Cologne Water.

Farina, J. Maria, opposite Joseph's Place, Cologne, for Cologne Water.

Farina, J. M., Old Market Place, Cologne, for Cologne Water.

Farina, Johann Maria, 2, Jülich's Place, Cologne, for Cologne Water.

Farina, Johann Carl, Cologne, for Cologne Water.

Farina, J. Maria, 4, Jülich's Platz, Cologne, for Cologne Water.

Fabian, E. G., Breslau, Germany, for samples of Pine Wool.

Faure and Escoffier, Avignon, France, for samples of Marrow Root and Prepared Powder.

Fruchet, Paris, France, for samples of Aromatic Vinegar, Toilet Cream, and Essences.

Frank, F., Cincinnati, U.S., for specimens of Lard Oil.

Freutler, Counsellor, Leutern, Silesia, for specimens of Wool.

Geeterayen, Van J. C. Hamme, East Flanders, for specimens of Starch.

Grass, Margaretha, Cologne, for Cologne Water.

Gehe and Co., Dresden, Saxony, for Chemical Apparatus.

Hjerta and J. Michaelson, Stockholm, Sweden, for specimens of Sulphuric Acid of 66 B.

Herbert, Franz Paul, Klagenfurt, Germany, for samples of White Lead.

Hotchkiss, H. G. and L. B., Lyons, Wayne County, New York, U.S., for Oils of Peppermint, Spearmint, and Wintergreen.

Howards and Kent, Stratford, England, for fine collection of Chemical Preparations.

Hänle, Leo, Münich, Bavaria, for specimens of Bronze Colours.

Herring, Charles F., Brooklyn, U.S., for specimens of Blacking.

Jager, Evert de, Zandyk, Netherlands, for samples of Starch.

Jolly, F., Mer. Loire and Cher, France, for Purified Oils for Watches, &c.

Jennings, Thos., Cork, Ireland, for Calcined Magnesia and Carbonate of Magnesia.

Jones, Stephen U., for Pyramid of Fancy Soap.

Johnson, Jonathan F., New York City, U.S., for specimens of Soap, plain and fancy, fine Perfumery and Extracts.

Knosp, Rudolf, Stuttgart, for Indigo, Carmine, &c.

Kinzelberger and Co., Prague, Bohemia, for Ultramarine and 180 samples of various Colours.

Lindmark, John, New York City, U.S., for fine Cologne Water.

Lamar and Pauris, Paris, France, for specimens of fine Perfumery.

Luhme, J. F. and Co., Berlin, Prussia, for Chemical Apparatus.

Leistner, G. L., Paris, France, for Water of Paris and other Perfumery.

Lanza Bros. and Co., Turin, Sardinia, for Stearine Candles and Stearine.

Lefevre, B., Paris, France, for various kinds of Varnish (with special approbation).

Lill, William, and Co., Chicago, U.S., for Cologne Water and Pure Spirits.

Lefevre, Senr., Nantes, France, for specimens of Oxyde of Zinc.

Michel, Alfred, Puteaux, France, for Extracts for Dyeing and Printing.

Mixer and Gilbert, Boston, U.S., for Patent Starch and Spermaceti Candles.

Mitchell, R. S., and Co., New York City, U.S., for Stearine Figures and Candles.

McFarline, Arch., Montreal, Canada, for samples of Glue prepared from common stock called Farmers' Pieces.

Miller and Co., A., Newburn, North Carolina, U.S., for Resin Oil.

Marquart, Dr. L. C., Bonn, Prussia, for collection of Chemical Productions.

Mason, James, and Co., Philadelphia, U.S., for specimens of Blacking.

Michael, Louis, New York City, U.S., for Fancy Soaps, Pomade, Extracts, &c.

McFadden, John, Hanson County, Ohio, U.S., for specimens of Wool.

Mitchell, Genl. J. D., Charleston, South Carolina, U.S., for a stalk of Pomegranate Cotton.

McClintock, W., and C., Demarara, for Bird's Nests.

Pommier, P., Paris, Carriage Varnish.

Pitencier, G., Odessa, Russia, for fine Stearine Candles.

Parker, David (Trustee), Shaker's Village, U.S., for specimens of Essential Oils, Medicinal Extracts, &c.

Poel, W. J., Zaandam, Netherlands, for specimens of Gelatine and Glue.

Puccio, Antonio, Genoa, Sardinia, for specimens of Sulphate and Quinine.

Parola, Luigi, Cuneo, Sardinia, for specimens of Ergotine.

Paoli, Christian, Springfield, Ohio, U.S., for pure Alcohol and Deodorized Cologne, spirit 98 per cent., for Medical and Chemical Purposes, &c.

Russell, Stiles, and Hubbard, Yonkers, U.S., for Extract of Logwood.

Roemer, Carl, Brühl, Rhenish Prussia, for Refined Oils, capable of resisting intense cold.

Rushton and Myers, Philadelphia, U.S., for specimens of Blacking.

Rice and Smith, New York City, U.S., for specimens of Perfumery and Fancy Articles.

Santo, A., Matanzas, Cuba, for specimens of Quinine and other Medical Preparations.

Setzer, J., Weitenek on the Danube, for various Shades of Ultramarine, Madder, &c.

Siegle, Henry, Stuttgart, Germany, for various Colours.

Soehnee Bros., Paris, France, for various kinds of Varnish (with special approbation).

Sanger, Augustus H., Danvers, U.S., for samples of Glue.

Sheppard, Samuel C., Philadelphia, U.S., for Citrate of Magnesia.

Schramm, L. F., Dessau, Germany, for specimens of fine Vegetable Oils for Watches.

Spahn and Schimmel, Leipsic, Saxony, for Essential Oils.

Stuurman, Jr. J., Zandyk, Netherlands, for samples of Starch.

Seabrook, William, Charleston, U.S., for sample of Sea Island Cotton.

Schiller, Caroline, Montreal, Canada, for Bark Box, with Moose Hair, &c.

Vanduura and Veusterven, Rotterdam, Holland, for samples of Oils and Colours.

Vandenbusch, J. J., Wilhelminadorp, W. Goes, Holland, for specimens of Madder manufactured by Steam.

Voute, W. H., and Co., Amsterdam, Holland, for assortment of Madder, Indigo, &c.

Violet, Paris, France, for collections of choice Perfumes.

Van Deventer, John, New York City, U.S., for Oil Paste Blacking and Waterproof Composition for Leather.

Viard, Louis, Paris, France, for a variety of Colours.

Van Geetrugen, Everaert, Hamme, East Flanders, for specimens of Starch.

Whiteley, N., New York City, U.S., for Patent Perfumed Oriental Crystal.

Warteburg, Count, York, Silesia, for specimen of Wool.

Wright, W. P., New York, U.S., for a Cotton Plant with Opening Pods.

Zinsser and Marx, New York City, U.S., for Bleached Shellac and French Varnishes (with special approbation.)

Zuber and Co., Rixheim, Haut Rhin, for samples of Artificial Ultramine, Green, &c.

Zanoli, Carl Anton, 92, High Street, Cologne, for Cologne Water.

ADDITIONAL.

Silver Medal.

American Linen Thread Company, Mechanicsville, New York, for superior excellence in Fabrication, Bleaching, and Colouring Thread.

Edwards, A. D., and Co., Dundee, Scotland, Flax and Tow Yarn.

Bronze Medal.

Buchanan, A., Massarooni, British Guiana, for Building and Ornamental Woods.

Cartwright, H., Essequibo, British Guiana, for Building and Ornamental Woods.

Dunbar McMasters and Co., Gilford, Ireland, for superior Linen Yarn.

Douglass and **Beer**, St. Louis, Missouri, U.S., for Dew Rotted Hemp.

Ellerman, A., Rotterdam, Holland, for Holland Flax.

Faustin I., Emperor of Hayti, for splendid block of Mahogany, and other productions of the Island.

Hunter, Hon. John J., Lexington, U. S., for American Dressed Hemp. Agents, Jas. McGregor and Co., New York.

Mansfield, John, Demerara, British Guiana, for Building and Ornamental Woods.

Saunders, John R., Missouri, U. S., for Dew Rotted Hemp, unshackled from the brake, produced by Sibley of Missouri.

Van Cats, J. P, Gouda, for Friesland Flax.

Widdows, F., New York, for "Metropolitan Crystal Cement."

Honourable Mention.

Baker, Bell and Co. Weston, Mississippi, U. S., for Dew Rotted Hemp.

Demarest, Joralemon and Co., for Twine manufactured from Belgian Flax.

French, James, New York City, U. S., for Shoe Thread and Flax Twines.

Falkoebaloof, Loon, Russia, for Flax of great beauty.

Holliday and **Dickey**, Weston, Missouri, U. S., for Dew Rotted Hemp.

Lecat-Butin, Bondues, Canton de Fourcoing, France, for Peeled Flax.

Leroy-Dubois, Illies Nord, France, for Raw and Peeled Flax.

Lotbiniere, Hon. G. Jolly, for Vegetable Fibre prepared from *Asclepias Canadensis*

Lytle, R. Hollidaysburg, Penn., U. S., for Planks of Wild Cherry from Cambria Co. in that State.

Pecquet, M., Quebec, C. E., for Dressed Flax.

Raffelsperger, F., Schönberg, Austria, for samples of Flax.

The Jury would specially notice—collection sent from British Guiana by J. S. Stutchbury, Esq., E S. Brotherson, W. C. McClintoch, Esq., of Barks, &c., used in medicine, and also the Fibres of Endogenous Plants from the same Province and from Hayti and the East Indies.

JURY C.

Class 9—Agricultural, Horticultural, and Dairy Implements and Machines.

Jurors.

Hon. HENRY WAGER, Western New York, Chairman.
WATSON NEWBOLD, Esq., Columbus, New Jersey.
WILLIAM EVANS, Esq., Montreal, Canada.
Col. JOHN W. PROCTOR, Danvers, Mass.
Major PHILIP R. FREAS, Germanstown, Penna.
HENRY S. BABBIT, Brooklyn, L. I., Acting Secretary.

Silver Medal.

Atkins, Jearum, Chicago, Illinois, for an exceedingly ingenious self-raking Reaper, exhibited by J. S. Wright, of Chicago, Illinois. The silver medal is awarded for the new mechanical principle as here exhibited in its adaptation to the Automaton Raker.

Ruggles, Nourse, Mason and Co., Boston and Worcester, Massachusetts, for the scientific principles which have been practically perfected by Samuel A. Knox, their artist, and adapted to the series of Sod and Stubble Ploughs exhibited by them.

Salmon, George B., Elgin, Illinois, for his Patent Grain and Grass Seed Separater.

Bronze Medal, with Special Approbation.

Allen, R. L., New York City, for general Collection of Agricultural Machinery and Implements.

Crosskill, William, Beverley, Hull, England, for a Sweeping Machine and for a Clod Crusher.

Dibbol, Joseph, Sidney, New York, for a very superior hand-made Axe-Helve.

Dick, David, Meadville, Pennsylvania, for his Patent Anti-Friction Cheese Press.

Emery and Co., Albany, New York, for a well-known and approved Endless Chain Horse Power, with an Overshot Threshing Machine attached.

Glover, Townsend, Fishkill, New York, for a beautiful collection of Fruits, Fungi, Fishes, and Reptiles in Composition.

Hall and **Speer**, Pittsburgh, Penna., for a Patent Hill-Side or Flat Land Swivel Beam, and Double-Flap-Mould-Board Cast Iron Plough.

Hargreaves, Thomas C., Schenectady, N. Y., for an Indian Corn Husking Machine.

Holwell, W. Antrobus, Quebec, Canada East, for an ingeniously constructed Fruit Gatherer.

Howard and Co., Buffalo, New York, for Ketchum's Mower.

Hughes, James, Cambridge, Indiana. for a Hand Mill for pearling barley and making hominy and samp.

Longett and **Griffing**, New York City, for their general collection of Implements, and the excellence of workmanship displayed.

Mayher and Co., New York City, for J. T. Grant's Patent Fanning Mill, and for general collection of Implements.

Massachusetts Shovel Company, Worcester, Mass., Sumner Balcom, Agent for Kimboll's Patent Shovels, with malleable iron sockets.

Millard, David J., Clayville, New York, for Hay and Manure Forks, Hay Knives and Scythes.

Palmer, William Russell, North Carolina, for an ingenious, but simple and effective Threshing Machine.

Pennock, S. and **M.** and Co., Kennet Square, Penna., for a Machine for sowing grain, grass seeds, guano, &c., in drills or broadcast.

Ralph and Co., New York City, for general collection of Agricultural and Horticultural Machines and Implements.

Ramsay, Wm. B. and **Geo. M.**, Washington, Penna., for a Harrow of a new, but simple, useful, and effective form of construction.

Ruggles, Nourse, Mason and Co., Boston and Worcester, Mass., for Armsby's Patent Corn Sheller, and for the general assortment of Agricultural, Horticultural, and Dairy Implements of their own manufacture.

Snyder, Elisha S., Charlestown, Virginia, for the combination which he has effected, and the practical application he has given the same, in his Labour-Saving Machine for thrashing, separating, cleaning, and bagging grain.

Tillinghast, Joseph B., Point Harmor, Chio, for his Patent Centrifugal Churn.

Wagner, Jeptha A., Pulteney, New York, for a Patent Clover and Timothy Seed Harvester.

Bronze Medal.

Allen, R. L., New York City, for a good display of Horticultural Implements.

Ames, Oliver, and Sons, North Easton, Massachusetts, for a case of heavy Shovels and Spades.

Bolles, L. and Co., Oxford, New York, for the best solid shank Cast Steel Hoes.

Burrall, Thomas D., Geneva, New York, for his Patent Reaping Machine, as an implement of known utility.

Bacon, Almon, Lyme, Connecticut, for a nest of Corn and Fruit Baskets (manufactured by Daniel Clarke,) of the best materials and skilful workmanship.

Babcock. A. S., Albany, New York, for an assortment of Horse-shoe and Sole Tiles, for draining land.

Crofut, Charles, Bridgeport, Connecticut, for a Portable Grain Mill.

Crosskill, William, Beverly, Hull, England, for Williams' Iron Harrow, as a superior implement for seeding; for the Archimedian Root Washer; and for his Agricultural One-horse Cart.

Daniels, Reuben, Woodstock, Vermont, for his patent Hay, Straw, and Corn-stalk Cutter, exhibited by John Mayher and Co.; also by Ralph and Co., of New York City.

De Beaune, Belgium, for a Grain Moistener.

Eddy, Dyer, and Co., Union Village, Washington Co., New York, for Tuplin's Sweep, or Lever, Horse Power, in connection with Eddy's small undershot Threshing Machine.

Hussey, Obed, Baltimore, Maryland, for his Machine for Reaping and Mowing, as a well-known and appreciated implement.

Hall and Speer, Pittsburgh, for Patent Two-horse Centre Draft Cast Iron Plough.

Kelsey, Christopher P., Livingstonville, New York, for a folding Adjustable Grain Cradle.

Kaemmerer, Captain E., Bromberg, Posen, Prussia, for a Patent Drill Plough, or Universal Seed-sowing Machine.

Longett and Griffing, New York City, for Hickock's Portable Cider Mill and Press; for the collection of Prouty and Mears' Ploughs, exhibited by L. and G.; and for their general collection of Implements, and the excellence of workmanship displayed.

Mayher, John, and Co., New York City, for Wheeler's Endless Chain Horse Power, with his Treshing Machine annexed.

Moffit, John R., Piqua, Ohio, for his Patent Threshing and Separating Machine.

Manny, John H., Freeport, Illinois, for a Reaping and Mowing Machine, from the assurances that it has heretofore given of practical utility.

McCormick, Cyrus H., Chicago, Illinois, for his Virginia Reaper and Mower (so-called), a Machine very much in use in this country.

Palmer, William, Russell, North Carolina, for an ingenious but simple and effective Threshing Machine.

Partridge, Henry, Medfield, Massachusetts, for a very superior collection of Potato Rakes and Manure Forks.

Ruggles, Nourse, Mason and Co., Boston and Worcester, Massachusetts, for Perry's Patent Meat Cutter; for a Vegetable Cutter; for the Double Sod and Sub-soil Plough, improved by the application of the principle discovered by Knox; for the Deep-tiller Steel Plough, denominated U. G., 3; for a Cast Iron Plough, numbered 73½, corresponding to the U. G., 3; for an improved One-horse Cultivator, with reversible steel teeth; and for their Flat Furrow Swivel, or Side Hill Plough.

Ralph and Co., New York City, for an assortment of Horticultural Tools.

Roderman and Ronce, St. Louis, Missouri, for an improved Two-wheeled Plough.

Reading, William, Flemington, New Jersey, for a Power Corn Sheller, of very great capacity.

Seeley, O. W., Albany, New York, for improved Patent Straw Cutters.

Smith and Fenwick, New York City, for a Patent Machine for Paring, Coring, and Quartering Apples.

Tuttle Manufacturing Company, Naugatuck, Connecticut, an assortment of Garden Tools, Potato Rakes, Hoes, and Hay Forks.

Tyler and McKenny, Clarksfield, Ohio, for a Model of an Eccentric Lever Press.

Van Brocklin, Winter and Co., Brantford, Canada West, for a Threshing and Separating Machine.

Woodward, Joshua, Haverhill, New Hampshire, for a Patent Corn and Seed Planter.

Honourable Mention.

Allen, R. L., New York City, for a "Harrow" invented by Hon. George Geddes; for Langdon's Potato Plough; for Budding's Patent Lawn Mower, and for Corn Shellers.

American Hoe Company, Winsted, Connecticut, for a very handsome Case of Hoes.

Abbe, R. M., Enfield, Connecticut, for a Model of a Pen, illustrating an improved method of feeding swine.

Backus and Barstow, Norwich, Connecticut, for Corn Shellers.

Beyerle, Jacob, Waidhofen, Austria Proper, for Scythes and Straw Knives.

Burrall, Thomas D., Geneva, New York, for his "Patent Mowing Machine."

Carter, Charles P., New York City, for an "Apple and Peach Parer and Discharger," as the best *paring* machine.

Cocone Giuseppe, Turin, Sardinia, for a Hand Machine for Sowing Grain broad cast or in drills.

Crosskill, William, Beverley, Hull, England, for "Crosskill's Patent Cast Wheels."

Chaleyer, Firminy, near St. Etienne, France, for Scythes and Sickles.

Crossmann, Edward, Canaan, Four Corners, New York, for "improved Scythe Rifles."

Coulaux and Co., Molsheim, Bas Rhin, France, for Scythes, Pruning Knives, Garden Shears, etc.

Cilley, N. W., Nottingham, N. H., for a Sliding Lever Gate.

Coats, William Bailey, Washington City, D. C., for a "Model of a Patent Hemp and Corn Cutter."

Deering and Dederich, Albany, New York, for a "Model of a Patent Parallel Lever, and horizontal Hay or Cotton Press."

Downer, John R. and R., Castleton, New York, for a Revolving Horserake; for a "Harrow" considered to be a very good implement for seeding purposes.

Dickson, Perry, Blooming Valley, Pennsylvania, for a small model of a Farm Sled, showing the application of a very simple, though ingenious, lock or brake.

Dennis, John H., Boston, Massachusetts, for a Bee Hive.

Davis, Sylvester, Claremont, New Hampshire, for his patent platform Bee Hive.

Duryea and Rhodes, New York City, for a handsome case of long and short handled Shovels and Spades.

Emery and Co., Albany, New York, for a Seed Planter.

Elliot, Augustus, San Francisco, California, for a "model of the Golden Harvester," having new and valuable improvements in the combination for reaping, raking and binding grain.

Forbush, E. B., Buffalo, New York, for a "Mowing and Reaping Machine," commended for its excellent workmanship and finish.

Francisco, S. P., Reading, Pennsylvania, for a "patent improved Churn."

Gregg and Denton, Peoria, Illinois, for an ingenious "Self-Raking Reaper," with an arrangement by means of an endless chain apron for discharging the grain in bundles.

Gibbs, Lucius H., Washington, D. C., for his "Rotary Spades."

Hathaway, Bradford, G. H., Rock Stream, New York, for a "Threshing Machine," easily converted into a clover seed Hulling and Cleaning Machine.

Hull and Speer, Pittsburgh, Pennsylvania, for the fine finish and workmanship displayed in the three ploughs exhibited by them.

Hulbert, Samuel, Prescott, Canada West, for a patent Plough.

Homer and Ladd, Boston, Massachusetts, for a "case of light Cast Steel Hoes" of a very superior quality.

Jerome, E. J. and F., Hempstead Branch, Long Island, New York, for a very good "endless chain, belt geared Horse Power."

Jones and Co., Gananoque, Canada West, for a "case of Shovels and Spades."

Jenken, W., Utrecht, Netherlands, for a "Sowing Plough of a new construction.

Knox, Samuel A., Worcester, Massachusetts, for his principle in the Mechanism of Ploughs, etc.

Kade, Jacob, Achern, Baden, for a good sample of German Scythes and Straw Cutting Knives, the best foreign implements of their kind on exhibition; and for a new "Seed Drilling Machine."

Longett and Griffing, New York City, N. Y., for "Bryant's Fanning Mill," a handsome machine constructed with glass sides, for showing at the Palace its operation and internal structure; for "Prouty and Mears' Double Sod and Subsoil Plough," and for "Corn Shellers."

Mayher, John and Co., New York City, for a "Scotch Harrow," and for well made "Corn Shellers."

Mansfield, Martin H., Ashland, Ohio, for a Clover "Seed Hulling and Cleaning Machine."

Mansfield and Lamb, Smithfield, Rhode Island, for superior "Scythes and Snaths."

Minor, Horton and Co., Peekshill, New York, for three Ploughs, of different sizes, exhibiting a commendable degree of skill in their workmanship.

Moody Edmund, Birmingham, Connecticut, for a Vegetable Cutter or Slicer.

Moore John, New York City, N. Y., for Straw Cutters, noted by the Jury for their simplicity and ease of keeping in order.

Mann Torrance and Co., Troy, N. Y., for McGregor's Agricultural Furnaces.

North and Denio, Fly Creek, New York, for a fine case of Hay and Manure Forks.

Owens, James D., Pittsburgh, Pennsylvania, for an Iron Mill for Grinding Feed; and for a model of Filson's Self-Adjusting Farm Gate.

O'Neil, John, Xenia, Ohio, for an Atmospheric Lever Churn.

Old Colony Iron Company, Taunton, Massachusetts, (John Bussing and Co., Agents, New York City,) for a beautiful case of good looking Shovels and Spades, of steel and yellow metal.

Offner, J. M., Wolfsberg, Carinthia, for a case of Scythes, bearing the words—"God bless the harvest."

Palmer, William Russell, North Carolina, for a patent Sweep (or Lever) Horse Power, of a new form of construction.

Palmer, Thomas, Camden, New Jersey, for the combination effected in P. W. Hardwick's Machine for Paring, Coring, and Slicing Fruit.

Peranoini, E., Turin, Sardinia, for a model of a Mowing Machine for Hay and Grain.

Penz, J., Mühleran, Tyrol, for different kinds of Scythes.

Phelps, E. W. and Co., Westfield, Massachusetts, for premium Combination Bee Hive.

Reading, William, Flemington, New Jersey, for a model of a Kiln for Drying Corn, &c.

Robinson, Ebenezer, Greencastle, Pennsylvania, for Mumma's patent Corn Sheller, as a good Machine, and for its ready convertibility into a Vegetable Cutter.

Rugg, Amos, Montague, Massachusetts, for improved bent Hand Hay Rakes.

Ruggles, Nourse, Mason and Co., Boston and Worcester, Massachusetts, for a neat chest with assortment of Horticultural Tools; for Sausage Fillers, in consideration of the superiority of their mechanism; for a Horse Hoe, and for the superior workmanship of their Ploughs, whether having steel mould boards and land sides, or made of iron.

Ralph and Co., New York City, for the Virginia Corn Sheller; and for a very convenient and cheap Fruit Gatherer.

Robertson, John, Long Point, Canada East, for a Seed Sower.

Snyder, George, Rhinebeck, New York, for a model of his perpendicular lever, toggle joint Hay Press.

Seymour, Morgan and Co., Brockport, New York, for a Reaping Machine.

Sharp, Theodore, Chatam Four Corners, New York, for an endless Chain Horse Power.

Snyder, Elisha S., Charlestown, Virginia, for a model of an ingenious Machine for Threshing, Separating, Cleaning and Bagging Grain.

Taylor, E. T. Thomas and Co., New York City, for a novel Straw Cutter.

Tobey and Anderson, Peoria, Illinois, for the good shape in the Shares of the steel Ploughs exhibited by them.

Tuttle Manufacturing Company, Naugatuck, Connecticut, for the evidenee of good workmanship, in a handsome case of Manure Forks.

Tyler and McKenney, Clarksfield, Ohio, for an eccentric lever Cheese Press.

Williams and Hackley, Belleville, New York, for a Cheese Press.

Zimmermann, G. F. S., Charlestown, Virginia, for a machine for Threshing, Cleaning and Bagging Grain, by one operation.

Sub-Jury C.

Class 3—Agricultural Products, Substances used as Food, Wines, Tobacco, &c.

Jurors.

Dr. A. S. ELWYN, Philadelphia, Pennsylvania, Deputy-Chairman.
Prof. JOHN A. PORTER, Newhaven, Conn.
JOHN ANDERSON, Esq., New York City.
H. D. TELLKAMF, Esq., New York City.
JAMES B. OAKLEY, Esq., New York City.
THOMAS HADDEN, Esq., New York City.
JOHN MARSHALL, Esq., New York City.

Silver Medals.

Borden Gail, Jr., Galveston, Texas, for Meat Biscuit.

Longworth, N., Cincinnati, Ohio, for Sparkling Isabella Wine, very superior quality, made from the Isabella Grape, and destined to be of great commercial value to our country.

Bronze Medals.

Alden, C., 314 Broadway, New York City, for Alden's Concentrated Milk, Cream, Coffee, and Prepared Cream, for use at sea.

Addison and Meade, Alexandria, Virginia, for Samples of "Gale Wheat," very superior.

Astengo, Matteo, Savonia, Sardinia, Italy, for Specimens of Vermicelli, or Paste of Genoa.

Bonnard, Louis, 72 Greenwich Street, New York City, for Alimentary Preserves.

Bogen, G. and P., Cincinnati, Ohio, for American Champagne Wine and Still Catawba, from the native Catawba Grape.

Buchanan, H., Cincinnati, Ohio, for Still Catawba Wine.

Bounin Freres, Nice, Piedmont, Italy, for Samples of Olive Oil.

Benners, J. E. New York City, for the best Sauce on exhibition, denominated Amazon Sauce.

Charlewood and Cummins, Covent Garden, London, England, for fine exhibition of Scotch Grain in the Ear.

Chollet and Co., No. 5 Rue Marbeuf, Paris, France, for Samples of Desiccated Vegetable, of various sorts.

Dufaville, W., Islington, London, England, for Culinary Articles: Fish, Crystal, Brilliant, and various other Gelatines, British Isinglass.

France, a collection of preparations of food of various kinds.

Fiton, J. sen., Bordeaux, Gironde, France, for a variety of Alimentary Preserves.

Favarger, A., Havana, Cuba, for Segars.

Glass, George M., Walworth, near London, England, for Gelatine Pastes and Lozenges, Jujube Pastes and Transparent and Opaque Isinglass.

Göttzenleuchter, Simeons and Co., Offenbach-on-the-Maine, Germany, for samples of Snuff.

Gremailly, sen., Hotel du Sauvage, Gray, Haute Saone, France, for Alimentary Preserves, (French cooking).

Gillet, Auguste and Co., Knevel, L'Orient, France, for sar lines in Oil, and other Alimentary Preserves.

Girardi and Brother, Turin, Italy, for superior Olive Oil.

Havemeyers and Moller, 26, Front-street, New York City, for highly-refined Sugar.

Hecker and Brother, New York, Farina, and a very great variety of preparations from cereal grains of extraordinary excellence.

Hayti, for superior Coffee, Chocolate, &c., exhibited by Henry Delafield, Esq., Consular Agent.

Johnson, Col. B. P., Albany, New York, for thirty varieties of Wheat.

Kirtland, B. B., Cantonment Farm, Greenbush, New York, for samples of Indian Corn.

Kittredge, Hon. E. E., Elm Hall, Parish of Assumption, Louisiana, for Plantation Sugar made from the cane.

Le Duc, M., Minnesota Territory, for specimens of Wild Rice, Flint Corn, Yellow and Striped Dent Corn, Winter and Spring Wheat, Barley and Maple Sugar.

Leroy, Dubois, Illies, Nord France, for Samples of Wheat.

Longworth, N., Cincinnati, Ohio, for Still Catawba Wine.

Lea and Perrins, Worcester, England, for Worcestershire Sauce.

Liberia, for very excellent Coffee, Cocoa and Sugar, exhibited by Captain Lynch, of the United States Navy.

Mulchowski, M., Russian Commissioner, Russia, for forty-nine varieties of Grains and Seeds from Russia.

Noble, Cooper and Bolton, 152, Fleet-street, London, England, for fine exhibition of English Grain and Seeds.

Paoletti, Giuseppe, Pontedara, Tuscany, Italy, for manufactures of Flour.

Rehfuss, L., Cincinnati, Ohio, for Still Catawba Wine.

Reinhart, C., Montreal, Canada, for superior Hams.

Royal Agricultural Society, Prince Edward Island, for samples of Wheat, Oats, Buckwheat, &c., exhibited by Whitman and Wheelock, New York.

Raymond and Schuyler, West Farm, New York, for very fine Pearl Barley.

Thompson, Samuel L., Setauket, Long Island, for samples of Wheats, Oats and Rye.

Upper Canada Provincial Agricultural Society, for very fine sample of White Wheat, produced by John B. Carpenter, Townsend, Canada West, weighing 66¼lbs. to the bushel.

Usher, R., Louisville, Kentucky, Spiced Beef.

Valdettaro, G., Genoa, Italy, for specimens of superfine Vermicelli or Paste of Genoa.

Werk, M., Cincinnati, Ohio, for sparkling Catawba Wine.

Whitlock, Nichols and Co., New York City, for superior assortment of Virginia manufactured Tobacco for chewing.

Winter, Dr. John, chairman of committee of gentlemen, residents of St. Johns, Newfoundland, for specimens of Barley and Oats, and Preserved and Smoked Meats.

Honourable Mention.

Allen, Julius, New York City, for Segars with gilt ends.

Alston, Hon. R. W. F., Pee Dee River, South Carolina, for samples of Rice of different years' growth.

Arkenburgh, R. H., New York City, for very superior specimens of Ohio Seed Leaf Tobacco, grown by Michael Moyer, Miami, Ohio.

Belling and Vogell, 217, Walker-street, New York City, plain and fancy Vermicelli, Maccaroni, &c.

Bingham, A. D., Michigan, for Crystal Flint Wheat.

Blow and March, New York City, for superior specimens of pound-lump Tobacco, manufactured by Armistead and Warwick, Lynchburg, Virginia.

Bernard Brothers, Offenbach on the Maine, Germany, for specimens of Snuff.

Berry, Walter W., Baltimore, Maryland, for superior specimens of Maryland Leaf Tobacco.

Blouin Hypolite, Berthier, Canada East, for Timothy Seed.

Boivin Louis, Cacouna, Canada East, for samples of Wheat.

Bartlett Smith, Belleville, Canada West, for samples of Peas.

Bailey, J. W., Megantic, Canada East, for Maple Sugar.

Brooke, W. F., Lynchburg, Va., for Peytona Tobacco.

Connolly, Charles M., New York City, for superior specimens of Virginia manufactured Tobacco for chewing.

Carstens, D. H. Lübeck, North Germany, for preserved Vegetables, Poultry, Fish, Fruits, and Milk.

Claus and Caron, Ghent, (East Flanders,) Belgium, for samples of Candied and other Sugars.

Couture, Francais, St. Ambroise, Canada East for Skinless Barley and Canadian Oats.

Dumhe, H., Cincinnati, Ohio, for samples of Catawba Wine.

Dolle, —, Franklin, Missouri, for specimens of Isabella Wine.

Du Barry and Co., Regent-street, London, England, for samples of Farinaceous Food.

Fricke, Frederick, Hermann, Missouri, for Catawba Wine.

Fletcher, Thomas S., Canaan, Vermont, for Maple Sugar.

Flint and Peabody, San Francisco, California, for Oats (the stalks of which were upwards of ten feet in length), and Wheat, presented by Berford and Co., New York City.

French, Lyon and Tabb, Dover, Kentucky, for a hogshead of superior Tobacco, and variety of specimens of the same, presented by R. L. Maitland, 63, Beaver-street, New York City.

Glasgow, William, St. Louis, Missouri, for Sparkling Catawba Wines.

Garcia, Emmanuel, New York City, for specimens of Havana Cigars.

Hoffman, J. B and Co., Albany, New York, for superior specimens of fine cut Tobacco for chewing.

Hotchkiss, Fenner and Co., New York City, for specimens of Virginia pound-lump Cavendish Tobacco.

Heard and Son, Fore-street, Bridgewater, England, rich Somersetshire Camp Sauce.

Herring, James, Toronto, Canada West, for White Marrowfat Peas.

La Pice, P.M., parish of St. James, Louisiana, for Paragon Sugar (so called), manufactured directly from the cane by a new process.

Lamere, Madam, St. Laurent, Canada East, for samples of Coloured Beans.

Lambly, —, Quebec, Canada East, for samples of Maple Syrup and Maple Sugar.

Maine, Joseph, No. 7, Union Court, London, England, for Gelatine in sheets, cut in fancy styles.

Middleton and Co., New York City, for very fine Arrowroot, produced by Josiah Dickinson, at Bermuda.

Miles and Peck, Yonkers, New York, Pearl Barley, Farina, Split Peas, &c.

Muir, J., Hinchinbroke, Canada East, for samples of Wheat, Peas and Oats.

McNaughton, Angus, Hinchinbroke, Canada East, for very superior Honey.

Muir, J., Hinchinbroke, Canada East, for a very good Cheese.

Maxwell, E., New York City, for very superior specimens of Virginia manufactured Tobacco.

McMullen. Robert G., Canada, for superior specimens of Irish Lundy Foot Snuff.

Paschal, Michael, Hermann, Missouri, for Cantawba Wine.

Polk, Right Rev. Leonidas, Leighton Plantation, Parish of La Fourche Interior. Louisiana, for Refined Sugars, Loaf, Crushed and Powdered.

Payne, George, Cowes, Isle of Wight, for Royal Osborne Sauce.

Pocquet, M., Quebec District, Canada East, for samples of Beans.

Rommel, Jacob, Hermann, Missouri, for Catawba Wine.

Robb, John, Montreal Canada East, for Wine Crackers.

Rousseau, Betsey, St. Hilaire, Canada East, for Maple Sugar, granulated, and in cakes.

Smith, Morgan, L., Texas, for Muscovado and Clarified Sugar.

Silverthorne, Francis, Toronto, Canada West, for samples of Pot and Pearl Barley.

Sinclair, P. C., Coburg, Canada West, for superior Coburg Sauce.

Tateosyan, H., 87, Bleecker-street, New York City, for Oriental Fig Paste.

Thompson, E. W., Toronto, Canada West, for samples of barley.

Wardell and Pease, 252, Front-street, New York City, for Pickled Oysters, Lobsters, &c.

Wolf, C. J., Washington, Missouri, for Catawba Wine.

Wayne, Mrs. William C., Wilton Bluff, Poupon River, South Carolina, for samples of Rice.

Westover, Asa, Dunham, Canada East, for samples of Maple Sugar and Syrup.

Zerega, Anthony, 97, Prince-street, Brooklyn, L. I., for Maccaroni and Vermicelli.

Sub-Jury on Flour and Indian Meal.

Sub-Jurors.

JAMES B. OAKLEY, Chairman.
JOHN MARSHALL, Esq.
THOMAS HADDEN, Esq.

Flour.—Silver Medals.

Hecker and Brother, New York, for Flour of extraordinary fine quality and of superior manufacture.

Welch, J. S., Shenandoah Mills, Clark County, Va., (L. Roberts and Co., agents, New York,) a very superior quality of Family and Market Flour, specially adapted for general use.

Bronze Medals.

Hawks, Isaac, Navarre Mills, Ohio, (J. B. Herrick, agent, New York).

Hill, C. J., and Son, Rochester, New York, (C. Dinsmore and Co., agents, New York.

Jordan and Sons, Tetschen on the Elbe, Bohemia, Wheaten Flour.

Honourable Mention.

Chamberlain, J. H., Akron City Mills, Ohio. (Wright, Gillet and Ranson, agents, New York.)

Cummer, L. A. and Co., Waterdown Mills, C. W.

Earhart, Roberts and Co., Winchester, Va. (Peter Saurwein and Son, agents, Baltimore.)

Ewart, J. D., Dundas, C. W.

Griffin, A., Ransom Mills, Waterdown, C. W.

Hinkley, J. N., Mumford, New York, (Beckerman and Brothers, agents, New York.)

C. A. Lowber, Shelby Centre Mills, Orleans County, New York. (Dows and Cary, South-street, New York, exhibitors and agents.) The barrel in which this flour was exhibited by Messrs. Dows and Cary is of extraordinary beauty of finish and workmanship, exceeding anything of the kind ever brought to the notice of the jurors.

Miles and Peck, Yonkers, New York.
Powell, Joseph, St. Louis, Mo.
Raymond and Schuyler, West Farms, New York (Faile, Williams and Co., agents, New York).
Roberts, A. S., and Co., Hannibal, Mo.
Standford, George, Rhinebeck, New York.

Rye Flour.

Fritz, P. C., ———————.
Miles and Peck, Yonkers, New York.

Buckwheat Flour.

Carpenter, W. B. C., New York.
Trenholm, Edward, Kingsey, C. W.

Indian Meal.

Hotchkiss, H. G. and L. B., Lyons, N. Y.

List of Wines and Spirits from the Empire of Austria, submitted to the Jury by Franz Raffelsperger of Vienna.

Raffelsperger, Brothers, Vienna, Voslauer Austich, 1834, Red Wine, good, like Burgundy; Prälaten Wein, 1834, White Wine, high flavour, with a light perfume of Apples; Stein Wein, 1834, White Wine, very fine.

J. G. Scherzer, Vienna, Hungary, Kahlenberger, 1811, White Wine, very superior, extra high flavoured; Tokay (king of Wines), Gold Wine, very superior, in all respects, nothing more to be desired; Slibowitz, 1797, Yellow Spirit, very superior. One sample of Tokay, was injured.

Genoa.—Carlo Perele, Genoa, Italian Beer and other Liquors. Very superior.

Deinhard and Jordan, Coblentz on Rhine, Sparkling Moselle. Very fine. Submitted by A. Seiffert, 32, Maiden Lane, New York City.

Italian Wines and Liqueurs, examined Saturday, November 12th.

Found very good: The liqueurs of Cora Brothers; Dettoni Brothers; G. Carpano, and Ratafia of A. Mossone.

Wines: Broglio and Aleatico, of Baron B. Ricasoli; Castel Grinzane Nebbiolo, Nebbiolo Fino, Oudard and Bruche; Manassi, of A. Roggiero; White Sardinian Wine, of G. Vassella; Passeretta d'Asti Barbera, Nebbiolo and wines of Asti, F. Varvello.

JURY D.

Classes 5, 6, and 7.

Machines for direct use, including Steam, Hydraulic, and Pneumatic Engines, and Railway and other Carriages.
Machinery and Tools for Manufacturing purposes.
Civil Engineering, Architectural and Building Contrivances.

Jurors.

Hon. CHAS. T. JAMES, Providence, R. I., Chairman.
VICTOR BEAUMONT, Esq., New York City, Secretary.
WM. B. LEONARD, Esq., New York City.
Hon. GEO. GEDDES, Fairmount, New York.
JOHN B. BELL, Esq., Pittsburgh, Pa.
JAMES BOGARDUS, Esq., New York.
J. W. AYRES, Esq., New York.
S. WOODRUFF, Esq., Hartford, Conn.

Silver Medals.

Ames, James T., Chicopee, Mass., for Eccles' Patent Gingham Loom.
Avery Sewing Machine Company, 251, Broadway, New York, for Sewing Machine.
Adams, S. and J., Boston, Mass., for Standing Printing Press.
Beardslee, G. W., Albany, New York, for Planing, Tonguing, and Grooving Machine.
Chichester, L. S., Brooklyn, New York, for Hemp and Flax Machine.
Childs, Augustus B., Rochester, New York, for his Grain Separator.
Fresnel's Light, exhibited by United States' Lighthouse Board.
Gwynnes and Sheffield, Urbana, Ohio, for Mowry's patent Stave-making Machinery.
Garretson, John A., Salem, Iowa, for a Hand Loom.
Gardner, George Arthur, Trinity Buildings, New York, for a Power Rock Drilling Machine.
Greely, Joseph, Nashville, N. H., for Eastman's Patent Stone Dressing Machinery.
Hutchison, C. B. and Co., Syracuse, New York, for Stave-making Machinery.
Leonard, William B., New York City, for Recording Dynamometer.
Lyon, Eliphalet, New York City, for Dudgeon's patent Portable Hydraulic Press.
Otis and Cottle, Syracuse, New York, for Power Morticing Machine.
Robinson, L. F., Hartford, Conn., for Burnap's Patent Press for laying Veneers.
Ransom, Franklin, Cincinnati, Ohio, for a Ship Pump.
Serrell, A. T., New York City, for Wood Moulding Machinery.
Smith and Knowles, for Knowles' Patent Hand-Saw and Saw Mill.
Slater and Steele, Jersey City, N. J., Spice Weighing and Packing Machine.
Trapp, Wm., Elmira, New York, Keg and Barrel Machinery.
Taylor, A. B. and Sons, New York City, for Printing Machine.
Wells and Hills, Milwaukie, Wis., for Hawkins' Patent Stave-making Machinery.
Winter, J. S., Montgomery, Alabama, for Horizontal Steam Engine.
Wyllys, Newell, Hartford, Connecticut, for Wyllys' patent Roller Cot-making Machine.

Bronze Medals.

Adams, N. and Son, Amherst, Massachusetts, for Felley Machine.
Ames, James T., Chicopee, Massachusetts, for Sewing Machine.
Ashcroft, E. H., Boston, Massachusetts, for Bourden's Patent Steam Gauge.
Ames, Horatio, Falls Village, Connecticut, for Cranks, Axles, and Tires for Locomotives.
Atkins, Jearum, Chicago, Illinois, for a new Automatic Mechanical Device.
Barlow, Nelson, New York City, for Wood-Planing and Matching Machinery.
Buck, M. and J. H., Lebanon, New Hampshire, for Daniel's Planing Machine.
Buck, M. and J. H., Lebanon, New Hampsh re, for Tenoning Machine.
Buck, M. and J. H., Lebanon, New Hampshire, for Morticing Machine.
Ball and Rice, Worcester, Massachusetts, for Morticing Machine.
Bemis, Charles W., Waltham, Massachusetts, for Scroll Saw.
Bates, Hyde, and Co., Bridgewater, Massachusetts, for a Cotton Gin.
Benjamin, W., and Son, Stockport, New York, for Reynolds' Patent Power Loom.
Bottom, J. M., Bridgeport, Connecticut, for Watchmaker's Lathes.

Bloodgood, W. E., Rahway, New Jersey, for Boiler Felting.

Brockhaus, F. A., Leipsic, Saxony, for Machine for Casting Tyyes.

Carver, E. and Co., East Bridgewater, Massachusetts, for a Cotton Gin.

Carver, Washburn, and Co., Bridgewater, Massachusetts, for a Cotton Gin.

Cooper and **Hewitt** (Trenton Iron Company) Trenton, New Jersey, for Iron Wire.

Cannon and **Brothers**, New Haven, Connecticut, for Galvanized Sheet Iron.

Cary, J. C., New York City, for Rotary Pump.

Cary, J. C., New York City, for Patent Clasp or Hose Coupling.

Dodge, John C., Dodgeville, Attlebro', Massachusetts, for Spinning Frame or Ring and Cap Spinner.

Dick, David, Meadville, Pennsylvania, for Anti-Friction Presses, Punches, Shears, &c.

Dowe, C. C., Mrs., New York City, for Bonnet Pressing Machine.

Fay, J. A., Norwich, Connecticut, for Hand Morticing Machine.

Foster, C., and **Brothers**, Cincinnati, Ohio, for Hand Printing Press.

Gibson, J., Albany, New York, for Woodworth's Patent Moulding Machine.

Gowdey, J. A., and **Sons**, Providence, Rhode Island, for Weavers' Reeds.

Grover, Baker, and Co., Boston, Massachusetts, for Sewing Machine.

Glendon Iron Works, Boston, Massachusetts for specimens of Iron Axles, &c.

Gallahue, A. C., Pittsburg, Penn., for Shoe-pegging Machine.

Harrison, Edward, New Haven, Connecticut, for Grist Mill.

Holden, Moore, Lawrenceville, Indiana, for Grist Mill.

Harris, F., and **Son**, Elizabethtown, New Jersey, for Scouring and Smut Machine.

Holmes and **Taylor**, Holyoke, Massachusetts, for Centripetal Press.

Jenks, Alfred, and **Sons**, Bridesburg, Pennsylvania, for Looms for Cassimeres and Ginghams.

Judson, Junius, Rochester, New York, for Valve Regulator.

Jeffers, Wm., Pawtucket, Rhode Island, for Fire Engine.

Johnson, L., and Co., Philadelphia, Pa., for Type-Casting Machinery.

Lowmoor Iron Company, England, for Specimens of Iron.

Leonard, P. A., New York City, for Iron Planer and Engine Lathe.

Mann, Charles F., Troy, New York, for Steam Engine and Pump.

Metcalf, A. W., 144, Centre Street, New York City, for Steam Cocks, Whistles, &c.

Maine, S. A. Dr., 29, Bond Street, New York City, for Oil and Grease for Machinery.

McAdams, J. and W., Boston, Massachusetts, for Paging Machine.

Noye, J. T., Buffalo, New York, for Grist Mill.

Noye, J. T., Buffalo, New York, for Flour Packing Machine.

Pell, Alfred, New York City, for Bogardus' Fire-proof Floor.

Parker, Alfred A., St. Louis, Missouri, for Tobacco Plug Machine Press.

Roger, M. Jr., France, for Burr Stones for Mills.

Ross, J. A., St. Louis, Missouri, for Miller's Sewing Machine.

Sandford, C., 89, Cedar Street, New York City, for Davis' Patent Dovetailing Machine.

Senneff, Jacob, No. 72 N. 3rd street, Philadelphia, Penn., for Patent Single Strand Metallic-eyed Loom Harness.

Singer, J. M., New York City, for Sewing Machines.

Soca Water Power Company, Biddeford, Maine, for Shaping Engines.

Sandford and **Liddle**, Erie, Penn., for Davie's Patent Punch and Shears.

Steward, Charles, New York City, for a Lathe made by him when fourteen years of age.

Starr, Charles, New York City, for Machines for Backing and Finishing Books.

Shands, J. G., St. Louis, Missouri, for Millstone Dressing Machine.

Smith, J. **Briggs**, Taunton, Mass., for Quartz Crushing Machine.

Union Power Company, New York City, for Gwynne's Centrifugal Pump.

Vingham, England, for Specimens of Iron.

Vine, William, Hartford, Connecticut, for Gold Beating Machine.

Vananden, H. A., New York City, for Sherwood's Patent Prismatic Turning Lathe.

Warren and **Bryant**, Lawrence, Massachusetts, for Machine Card Clothing.

Wickersham, Wm., Boston, Massachusetts, for Wax-Thread Sewing Machine.

Wheeler and **Wilson**, Watertown, Connecticut, for Sewing Machine.

Whitworth, Joseph, and Co., Manchester, England, for Shaping Engine, Lathe, &c.

Wright, Wendell, New York City, for Friction Pulley, or Toggle Joint Clutch.

Honourable Mention.

Adams, N., Cornwall, New York, a Brick-making Machine.

Allaire Works, New York City, an Oscillating Cylinder.

Arnold and **Felton**, New York City, a Regulator of the Feed Water of Steam Engines.

Ball and **Rice**, Worcester, Massachusetts, Daniel's Planing Machine.

Ball and **Rice**, Worcester, Massachusetts, a Moulding Machine.

Brandred, B., and **Son**, Oldham, New York, a Cotton Spinning Frame.

Burnett, W. J. and J. H., New York City, a Patent Graduating Valve Forge Tuyere.

Bridges and **Brothers**, New York City, Richardson's Patent Oil Cups, manufactured by H. De Wolf, at Westminster, Vermont.

Butler, E. T., Buffalo, New York, a portable Flour Mill.

Bollman, Wendell, Baltimore, Maryland, Railway Bridge.

Baldwin, David, Godwinsville, New Jersey, Railway Signal Telegraph.

Beckerer, G., Groningen, Holland, model of a Circular Stairway.

Beer and **Nathan**, New York, for Senechal's Glove Cutter.

Bowles, W., New York City, India Rubber Paint.

Bussing, R. S., New York City, Buffum's Patent Amalgamator.

Brown and **Ellis**, New York City, Hot Water Apparatus.

Carnell, Charles, Germantown Road, Penn., a portable Brick Press.

Cowdin, James D., Fitchburg, Mass., Weavers' Reeds.

Caledonian Tubular Company, Glasgow, Scotland, Lap Welded Iron Tubes.

Corning, E. and Co., New York City, American Vices and Anvils.

Cochran, James, New York City, Hydrant upon a new principle.

City Hose Company, (No. 8) New York City, Hose Carriage.

Clayton, E. B. and **Sons**, New York City, Copying and Sealing Presses.

Carr and **Hughes**, Cambridge, Indiana, Bran Duster or Atmospheric Bolt.

Corning, E., and Co., Albany, New York, a Locomotive Jack.

Connelly, E. G., Indianapolis, Indiana, a Gravitating Bolt Sash-Lock.

Cochran, James W., New York City, Quartz Crushing Machine.

Carter, J. A., New York City, Quartz Crushing Machine.

Dodge, L. P. and W. F., Newburg, New York, Suction and Force Pumps.

Douglass, W. and B., Middletown, Conn., Pumps and Hydraulics Rams.

Dubois and **Company**, New York City, a Model Door.

Dornbrach, Ferdinand, New York City, model of a Spiral Staircase.

Earle, T. K. and Co., Worcester, Massachusetts, Card Clothing.

Engine Company, 41, New York City, a Fire Engine.

Eliaors, A., Boston, Massachusetts, model of the Self-Sustaining Circular Stairway, made for James G. Blake, Esq.

Egger, J., Villach, Carinthia, a coil of Lead Pipe, eighteen hundred feet in length.

Fay, J. A. **and** Co., Norwich, Connecticut, Daniel's Planing Machine.

Fay, J. A. **and** Co., Norwich, Connecticut, Tenoning Machine.

Fay, J. A. **ann** Co., Norwich, Connecticut, Moulding Machine.

Flat Rock Iron Works, Iron Plate.

Fink, A., Baltimore, Maryland, Suspension Bridge.

Franklin and Fora, Philadelphia, Pennsylvania, Venetian Blinds.

Gibson, John, Albany, New York, Woodworth's Planing Machine.

Griffin, H., New York City, Town's Patent Paging Machine.

Gilbert, Isaac I., New York City, Leather Belting.

GRIFFITHS, S. AND J., Philadelphia, Pennsylvania, Brass Cocks, Valves, Whistles, &c.

HARRIS JOSEPH, Boston, Massachusetts, a Circular Saw.

HINCKLEY, Z. R., Sandwich, Massachusetts, Nail-making Machine.

HILLS, SAMUEL C., New York City, Tremper's Governor and Valve.

HOPE HOSE COMPANY, Philadelphia, Pennsylvania, Hose Carriage.

HICKOK, W. O., Harrisburg, Pennsylvania, Ruling Machine.

HUGHES, JAMES, Cambridge, Indiana, Hominy and Samp Mill.

HOLMES, JOSEPH E., New York City, Portable Iron Crane.

JACQUIN, M., Paris, France, Circular Knitting Machine.

JOHNSON, JOHN R., Geneva, New York, Portable Steam Engine.

JONES, JOHN AND Co., Wayne Co., New York, a Typographer.

JOHNSON, JOSEPH, Wilmington, Delaware, a Bran Duster.

JACKSON'S Annunciator, Thomas Chalmers, Agent, corner Canal and Centre streets.

KELLOGG, E. AND Co., Pine Meadow, Connecticut, Rag Carding Machines.

KITSON, RICHARD, Lowell, Massachusetts, Needle-pointed Card Clothing.

KUMBELL, W., New York City, Machine Banding.

KING, J. T. AND Co., New York City, Steam Washing Apparatus.

KENDRICK, JOHN, Providence, R.I., Cotton, Worsted, and Wire Harnesses for Machinery.

LAWRENCE MACHINE SHOP, Gordon McCay, Treasurer, Lawrence, Massachusetts, Hand Drill and Trip-Hammer.

LEONARD, B. F., Sandwich, Massachusetts, Car Wheels.

LOWMOOR IRON COMPANY, Yorkshire, England, (W. B. Lang, Agent, 24, Broadway, New York City,) Car Wheels.

LAMOTHE, BERNARD J., New York City, Life Preserving Car.

LEONARD, P. A., New York City, Leather Belt.

LAW, H., New York City, a Standing Press.

LYON, LUCIUS, New York City, Lightning Rod.

MASON, J., Manchester, England, Fly Frame and Slubbing Frame.

MORRIS, TASKER AND MORRIS, Paschal Iron Works, Philadelphia, Pennsylvania, Gas and Steampipes, &c.

MASON, J., Manchester, England, Vice and Lathe Chucks.

MOODY AND MASON, Bridgeport, Connecticut, The "Portable Grain Mill, Tom Thumb."

MÜHLLER AND MORRELL, New York City, Winding Stair Case.

MINNIS, THOMAS S., Meadville, Pennsylvania, Invalid Locomotive Chair.

MONCHARMONT, M., Nevers Quarries, Nièvre, France, Burr Stones for Mills.

NEPTUNE HOSE COMPANY, Philadelphia, Pennsylvania. Hose Carriage.

NICHOLLS, OLDEN, Lowell, Massachusetts, (Lorrin Way, Agent,) Corn and Cob Crushers.

NUTTING MIGHILL, Beverly, Massachusetts, Expanding Window Sash.

NEVINS, W. R., New York City, Biscuit and Cracker Machines.

PAGE, GEORGE AND Co., Baltimore, Maryland, Portable Saw Mill.

PARSONS, S. E., Wilkesbarre, Pennsylvania, Self-straining Saw.

PARKS, J. E., New York City, Lithographic Press.

PROSSER, THOMAS AND SONS, 28, Platt Street, New York City, Cast Steel Tire.

PASQUAY AND BROMHILL, New York City, Leather Belting.

PFEIFLER, ALOIS, New York City, Ice Cream Freezing Machine.

PEUGEOT, C. AND Co., Andincourt, Doubs, France, Roving and Spinning Spindles.

ROSSELL AND Co., Trenton, New Jersey, American Anvils.

RUGGLES, NOURSE, MASON AND Co., Boston and Worcester, Massachusetts, Hitchcocks Combination Pump.

RICHARDSON, BARNUM AND Co., Lime Rock, Connecticut, well chilled Car Wheels.

REYNOLDS, SAMUEL, Smithville, New York, Water Wheel.

SAMUEL, JOSEPH, Grenoble, France, Machine to measure the hand for Gloves.

SANDS AND CUMMINGS, Washington City, D. C., Brick Making Machine.

SAUNDERS. W. H. T., Hastings, New York, Steel Converted Carriage Axles.

SHATTUCK, W. F., Waterford, New York, Car Wheels.

STEVENS, JAMES, London, England, Railway Signals.

SMITH, H. CLAY, New York City, improved Window Frame.

SLADE, R. T., England, Elevator for Mines.

SMITH, ALBERT M., Rochester, New York, Screw Belt Clasps.

SECOR, JAMES, St. Louis, Missouri, Submerged Current Wheel.

TAINTER, DANIEL, Worcester, Massachusetts, Machine Cards.

WOOD AND HUNTER, New York City, Brass Cocks, Valves and Steam connections.

WILLIAMS, EZRA S., Deep River, Connecticut, Hubbard's Rotary Pump.

WHITE, M. M., New York City, Long's Patent Iron Railway Bridge.

WASHBURN, N., Brandon, Vermont, Car Wheels.

WHITWORTH, J. AND Co., Manchester, England, model of Street Sweeping Machine.

SUB-JURY D. on Carriages, from Class 5.

Sub-Jurors.

JAMES M. QUIMBEY, Esq, Newark.
SAMUEL K. BAYLEY, Esq., Boston.
JOHN S. GOOLD, Esq., Albany.

Silver Medal.

MOUSSARD, ALEXIS P., Paris, France, for a very beautiful and elaborately finished Carriage for Gala days, exhibiting much skill and taste in all its appointments.

Bronze Medals.

BRADLEY AND WOODRUFF, Rahway, New Jersey, for Buggy Wagons, with Hubbard's Patent Self-Adjusting Springs.

MINER AND STEVENS, 368, Broadway, New York City, for a Barouche, Phaeton and Light Wagon.

SMITH, J. L., 28, East 29th Street, New York City, for an Improved Buggy with Falling Top and Bracket Front.

SAURIN, J. J., Quebec, Canada, Two Sleighs.

STEPHENSON, JOHN, 47, East 27th Street, New York City, for an Omnibus for Twelve Passengers.

WOOD, TOMLINSON AND Co., 410, Broadway, New York City, for a Four-Wheeled Dog Cart.

Honourable Mention.

AMITY HOSE COMPANY, 38, New York City, for Hose Carriage.

DUSENBERY AND ARTHUR, 162, Laurens Street, New York City, for a Light Trotting Wagon.

LEHMAN. J. S., Rotterdam, a Phaeton Carriage.

ROBINSON, THOMAS L., Boston, Massachusetts, for Elaborately-finished Sleigh.

SCRIPTURE, E. S., Green Point, New York, for an Improved Wood Axle, exhibited in connection with a Patent Top Buggy.

WATSON, GEORGE W., Philadelphia, Pennsylvania, for a Gazelle Wagon.

JURY E.

Class 8—Naval Architecture, Military Engineering, Ordnance, Armour and Accoutrements.

Jurors.

Lt.-Col. Sir JAMES E. ALEXANDER, A. D. C., Canada, Chairman.
E. K. COLLINS, Esq., New York.
Capt. GEO. W. CULLUM, U. S. Corps of Engineers.
Capt. CHAS. H. BELL, U. S. Navy.
Col. A. G. HAZARD, Enfield, Conn.
Col. JAMES PAGE, Philadelphia.
F. TELLINGHAUS, Esq., New York.
Major A. MORDECAI, U. S. Ordnance Department, Reporter.

Silver Medal.

Colt, Samuel, Hartford, Connecticut, for various kinds of Revolving Fire Arms. The wide-spread reputation and extended use of these arms entitle the inventor, in the opinion of the jury, to the highest distinction which they can award. The arms presented at the Exhibition are of superior workmanship and finish.

Delano, U. S., Naval Constructor, for a model of a War Steamer. This model is highly approved as combining all the elements necessary for a vessel of that class, viz.: buoyancy, stability, speed, with ample room for stores, crew, &c.

Lowton, Captain, for a Temporary Rudder of much approved construction.

Steers, George, for model of Yacht "America." This model is superior to all the others presented.

Bronze Medal.

Ames Manufacturing Company, Chicopee, Massachusetts, for specimens of Bronze Cannon, regulation and fancy Swords and Sabres of superior workmanship and finish.

Crause, C. P., Herzberg in the Harz, for Rifles and Pistols of very good workmanship.

Crolius, William, New York, for a model of a Corvette, well calculated for a vessel of war.

Deane, Adams and Deane, London, for a Fowling Piece of superior quality, (exhibited by Henry Tomes and Co., New York).

Dreyse and Collenbusch, Sömmerda, Prussian Saxony, for Waterproof Percussion Caps.

Eley, W. and Chas., London, for Sporting Ammunition, Wire Cartridges, Percussion Caps, &c., all of excellent quality.

Falisse and Trapmann, Liege, Belgium, for Rifles, Guns, Pistols, and Percussion Caps.

Francis Metallic Life Boat Company, New York, for a Man of War Cutter.

Greener, Wm., Birmingham, England, for Fowling Pieces and Sporting Apparatus of superior quality and excellent finish.

Greener, Wm., Birmingham, England, for three Whaling Guns and apparatus for killing whales.

Hidden, Enoch, New York, for a Percussion Cannon Lock of his invention, which has been thoroughly tested and approved in the United States Service, (attached to 6-pounder gun mounted.)

Horsman, W. H. and Sons, Philadelphia, for Military Goods, Passementerie, &c. This collection comprises many articles of personal equipment for Military and Naval service, all manufactured by the exhibitors, with the exception of the sword blades. The articles specially deserving attention are gold epaulettes, and cotton and worsted epaulettes of very handsome pattern and finish, silk sashes, rich gold lace with blue stripe, swords well got up for the U. S. Service, and especially well balanced and mounted.

Houllier, Blanchard, Paris, for a Double Barrelled Fowling Piece, lined with Platinum. This Fowling Piece is remarkable as a curious specimen of peculiar workmanship. The barrels are lined with platinum, and on the exterior they are galvanised and otherwise protected from oxidation, so that as the inventor asserts, the piece is absolutely exempt from injury by rust or neglect of cleaning. The very great cost of the work forbids the expectation that the invention will be of general practicable utility.

Kearney, Richd., St. Johns, Newfoundland, for a model of a Ship's Hull.

Krider, John, Philadelphia, for Fowling Pieces, Rifles and Pistols of very good workmanship.

Nowak, F., Prague, Bohemia, for a Double Barrelled Gun and Target Pistols of superior finish.

Prelat, Paris, for a pair of Pistols and Appurtenances. These pistols are highly finished and superbly inlaid with gold at a great cost.

Richards, Westley, London, for a Fowling Piece of superior quality, exhibited by Henry Tomes and Co., New York.

Sharp, C., Hartford, Connecticut, for Arms loading at the breech. Without reference to the merits of the peculiar methods of priming which are attached to these arms, the jury are of opinion that Mr. Sharp's ingenious arrangement for loading at the breech is the best which has been presented at the Exhibition; and that it bids fair to sustain with favourable results the test to which it is now being subjected in the hands of troops in the field. The specimens of these arms, offered for examination, are of excellent workmanship and neat finish.

Thornton Grimsley and Co., St. Louis, Missouri, for complete Military Equestrian Equipment for a Major-General and a Colonel in the United States' army. The materials and workmanship are of fine quality and character; the construction of the saddle, combining all the modern improvements, and presenting a superior and useful article of Equipment.

Tracy and Brand, Norwich, Connecticut, for improved Whaling Gun and Bomb Lance for killing whales. This gun is easily portable (weighing but 10 lbs.), and the convenience with which the explosive lance can be used renders it worthy of special notice as a serviceable adjunct to the weapons now generally employed for taking Whales.

Walker, Richd., Birmingham, England, for a case of Percussion Caps not charged, but of superior finish.

Westervelt, Daniel D., New York, for model of Pilot Boat "Enchantress."

Honourable Mention.

Allen and Thurber, Worcester, Massachusetts, for a Variety of Fire Arms.

Burr, Waterman and Co., New York, for Ship's Blocks of superior quality.

Capewell, Joseph F., Woodbury, Connecticut, for Leather Shot Belts and Shot Pouches of neat finish.

Corbiere and Tucker, New York, for Life Preservers.

Derby, F. and Sons, New York, for Full Dress Uniforms of the Commissioned Officers of the United States Army and Navy.

Eickhorn, (Widow) and Son, Solingen, Prussia, for a Case of Swords and Sabres.

Foster, Wm., Newark, New Jersey, for a Variety of Powder Flasks.

Funk, J. and Sons, Suhl, Prussia, for a Rifle with Damasked Barrels.

L'Hommeur, I. P., Liege, Belgium, for Eight Double-Barrelled Guns, some of them very well finished.

Manton, John, and Son, London, for two Double Fowling Pieces of neat finish.

Matthewman, John, New Haven, Connecticut, for Copper Powder Flasks.

Massachusetts Arms Company, Chicopee, Massachusetts, for Patent Revolvers and Sporting Guns, with Maynard's Self-Primer attached. The Jury think that this ingenious contrivance is worthy of special notice, although the test of actual service is yet required to ascertain its real value for use in the field, either for sporting or for war purposes.

Sollace, Rowland D., Agent, New York, for Percussion Caps of good quality and of American manufacture,—exhibited by him.

Tomes, Francis, and Sons, New York, for Guns, Pistols, and Powder Flasks.

Walker, Robt. S., New York, for American, British, and French National Flags.

Walker, S. and Co., Birmingham, England, for Percussion Caps.

United States, No. 1.

The Jury have not regarded the articles manufactured at Government establishments as being exhibited in competition with those made by private manufacturers; but they think it proper not to pass unnoticed the collection of Field Artillery Carriages and Equipments made at Watervliet Arsenal, and the Muskets, Rifles, Musquetoons and Pistols made at the United States, Armories at Springfield and Harper's Ferry, which have been deposited by permission of the War Department. All these articles are of excellent workmanship, and they are finished in a neat and serviceable shape, in all respects creditable to the Establishments where they were manufactured.

United States, Nos. 16, 27, and 34, Models of Ship Hulls and Clipper Ships, by Robert Underhill, Jeno Gran and D. Westervelt, are very much approved; but for want of information relative to their capacity, displacement, &c., the Jury cannot decide on the superior merits of any of them.

The want of similar information also prevents them from determining the relative merits of the Models of Steamers, the general appearance of which is favourable.

No opinion can be given with respect to Wheels Capstans, and some other articles exhibited, for want of proper explanations from the inventors.

Great Britain, Nos. 1 to 6.

The Jury beg to direct the special attention of the Commissioners of the Exhibition to the curious and highly interesting Collection of Ancient Armour, and of Ancient and Modern Arms, which cannot be seen elsewhere in the United States, and for which our warmest acknowledgments are due to the Board of Ordnance, by whom they were kindly contributed, from the Collection in the Tower of London.

Jury F.

Part of Class 10, Class 10*a*, 10*b*.—Philosophical Instruments, and Products resulting from their use; Daguerreotypes, Maps and Charts, Horology, Surgical Instruments and Appliances.

Jurors.

Professor J. RENWICK, Chairman.

Prof. A. CLARK.
Dr. GAILLARDET.
Dr. ELLET.
A. B. DURAND, Esq.
Prof. T. L. BUCKINGHAM.
GEO. W. BLUNT, Esq.
Dr. PARKMAN.
W. DARLING CAMPBELL, Esq.
Lieut. A. NOBLE, R. A.
Prof. CARNOCHAN.
H. R. KIMBERLY, Esq.
Capt. FOX.
Gen. T. S. CUMMINGS.
Dr. E. G. LUDLOW.
Dr. WILLARD PARKER.
Dr. J. TRENOR.
Dr. E. PARMLY.
Dr. C. C. ALLEN.
CHAS. C. INGHAM.
Dr. J. BRYANT SMITH, Acting Secretary.

Silver Medal.

Charriere, Fils, Paris, France, for a case of highly finished and ingenious Surgical instruments.
House —, exhibited by J. B. Richards, New York, U. S., for House's Telegraph.
Luer, Amatus, Paris, France, for Surgical Instruments, original and highly finished.
Morse, Prof. S. F. B., exhibited by W. M. Swain, U. S., for Morse's Telegraph.
Palmer, Frank B., Philadelphia, U. S., for best Artificial Leg.
Spencer, Chas. A., U. S., for Microscope and improved Object Glass.
Whipple, John A., Boston, Massachusetts, U. S., for Crystallotypes, a new art.
Trott, Stanley G., New London, Connecticut, U. S., for Abbott's Horometer.

Bronze Medal, with Special Approbation.

Chamberlain and Ritchie, Boston, U. S., for Air Pump, &c., of superior workmanship.
Downs, Samuel, U. S., for Dry Gas Meter.
Duboscq-Soleil, Paris, France, for Heliostat Polariscope, &c.
Fairbanks, E. J. and Co., St. Johnsbury, U. S., for Platform Balances.
Wergeland, Oscar, Sweden and Norway, for Manuscript Map, as best of the class.

Bronze Medal.

Audemars, Louis, Canton Vaud, Switzerland, for Pocket Chronometer.
Alt, Charles, New York, U. S., for Opera Glasses.
Abbey, Charles and Sons, Philadelphia, Pa., for Dentists' Gold Foil.
Ambler and Averey, New York City, for the largest collection of Specimens of Mechanical Dentistry.
Butler, Alexander, U. S., for several excellent Daguerreotypes.
Batchelder, John M., Boston, U. S., for Elastic Telegraph Insulator.
Beranger and Co., Lyons, France, for Patent Balances.
Barkenberg, John, New York City, U. S., for Chemical Balances, &c.
Becker and Co., Arnhem, Holland, for Chemical Balances.
Brady, Matthew B., New York City, U. S., for uniformly excellent Daguerreotypes.
Capt, H., Geneva, Switzerland, for Watches and Automaton Bird.
Copley, Charles, Brooklyn, U. S., for Globes.
Collins, H. G., Great Britain, for Maps and Atlases.
Collins, H. G., Great Britain, for Maps in relief.
Davidson, J. M., New York, for Adhesive Plaster.
Drake, John, F. and Co., New York City, U. S., for an Artificial Leg.
Downs, Samuel, U. S., for a Wet Gas Meter.
Derne, A., New York City, U. S., for Opera Glasses and Telescopes.
Delsol, T. T., Paris, France, for Map of Switzerland.
Durkee, Silas, Boston, U. S., for Microscopic Objects.
Elliott, B., U. S., for Telegraphic Insulator.
Elliott and Sons, London, Great Britain, for a Dumpy Level.
Elliott and Sons, London, Great Britain, for Opera Glasses and Telescopes.
Elliott and Sons, London, Great Britain, for Drawing Instruments.
FitzHenry, New York City, U. S., Equatorial Mounting of a Telescope.
Fehrens and Albrecht, New York City, U. S., for Drawing Instruments.
Finn and Baker, New York City, U. S., for Ivory and Boxwood Scales.
Gray, James, New York City, U. S., for Human Artificial Eyes.
Glover, Thomas, London, Great Britain, for Model of Gas Meter.
Gray and Keen, Liverpool, Great Britain, for Ships' Compasses.
Gysi, Frederick, Canton Argovie, Switzerland, for Drawing Instruments.
Grunow and Brothers, New Haven, U.S., for Microscopes.
Harrison, C. C., New York City, U. S., for Cameras.
Hughes, William, (an Apprentice,) Brooklyn, U. S., for highly finished Silver Bougies, Catheters, &c.
Hesler, Alexander, U. S., for several beautiful Daguerreotypes, ("Toilet," "3 Pets and others.")
Jones, White, and McCurdy, Philadelphia, U. S., for best Artificial Teeth.
Kern, J., Canton Argovie, Switzerland, for Drawing Instruments.
Laidlaw, John, jun., New York City, for Gas Meters.
Lebrun, A., Paris, France, for Opera Glasses.
Lemaire. Paris, France, for Opera Glasses.
Lewis, J. and J. W., for Coating Box.
Luhme and Co., Berlin, Prussia, for Chemical Balances.
Lawrence, Martin M., U. S., for excellent Daguerreotypes, particularly "Past, Present, and Future."
Murray, Dr. Alexander, New York, for Microscopic Preparations, illustrating objects of natural history.
Mather and Co., Switzerland, for a Lithographic Map.
Marsh and Co., New York City, U. S., for Trusses and Suspension Bandages.
Negus, Thomas S., and Co., New York City, U. S., for Marine Chronometer.
Nachet, Paris, France, for Microscopes.
New York Scale Makers' Co., New York City, U. S., for Platform and other Scales.

Pike, Benjamin, jun., New York City, U. S., for Air Pump.

Prentice, James, New York City, U. S., for Drawing Instruments.

Petermann, Augustus, London, Great Britain, for Maps, &c.

Pauling, Jacob, Vienna, Austria, for Maps in relief.

Powell, James W., M.D., New York, U. S., for Self-acting Eye and Ear Fountains and Artificial Leg.

Plaut, Henry, France, for Photographic Apparatus.

Raffelsberger, Franz, Vienna, Austria, for Cheap Maps.

Root, Samuel, New York City, U. S., for fine Daguerreotypes.

Steiner, Joseph, New York City, for Voltaic Chains, &c.

Smith, Samuel B., New York City, U. S., for Electro Magnetic Machines.

Solomon, Joseph, London, Great Britain, for Stereoscopes, Telescopes, &c.

Selpha, William, New York City, U. S., for Artificial leg.

Vale, G., New York City, U. S., for manner of mounting Globes in Armillary Spheres.

Vedy, F., Paris, France, for Sextants, Circles, &c.

Waldstein, H., New York City, U. S., for Opera Glasses, &c.

Welch, Benjamin, Lakeville, Connecticut, U. S., for Surgeons' Splints.

Wyld, James, London, Great Britain, for a Block Map.

Honourable Mention.

Adams and Tagliabue, New York City, U. S., for Barometers.

Adami, Zollverein, for Globes.

Ackland, W., London, Great Britain, for Hydrometers and Mathematical Instruments.

Amsler, Charles F., Philadelphia, U. S., for Eliptical Compass.

Borel, H. G., Neuchatel, Switzerland, for Pocket Chronometers.

Breitling and Laiderich, Switzerland, for Watches and Watch movement.

Billon, Louis, New York City, U. S., for one Pocket Watch.

Barlow, Thomas H., Lexington, U. S., for Planetarium.

Ballard and Kingsley, for superior Block Work, and imitation of Natural Teeth.

Branique, J., Brooklyn, U. S., for regulated misplaced Teeth.

Campbell, John R, New Jersey, U. S., for Pocket Chronometer.

Colton, J. H., New York City, U. S., for Geographical Maps.

Cowperthwaite, T. and Co., Philadelphia, U.S., for Geograpical Maps.

Chapman, James, Brooklyn, U. S., for Historical Chart.

Chambers, Cyrus, Jr. Pennsylvania, U. S., for a Lilliputian Steam Engine.

Cowderoy, Richard F., London, Great Britain, for Chronometer and Duplex Watches, (special approbation.)

Drips, Matthew, New York City, U. S., for Map of New York.

Daguet, Theodore, Neufchatel, Switzerland, for Optical Instruments.

Estehart, John, (aged 14,) Lapraire, Canada East, for Manuscript Maps.

Dutertre, Auguste, Geneva, Switzerland, for Miniature Watches.

Frodsham, Charles, London, Great Britain, for Astronomic and Mantle Clocks.

Favre, Henri Auguste, Switzerland, for Chronograph.

Foote, Edward, Jersey City, U. S., for Micrometro Balance.

Fisher, Thomas, Philadelphia, U. S., and special approbation, for Dial of the Seasons.

Fisher, Thomas, Philadelphia, U. S., and special approbation, for Mathematical Diagrams.

Fistzgibbon, J. H., Electrotypes of Daguerreotypes.

Fowler, James, New York City, U. S., for superior workmanship in Dentistry.

Grandjean, Henri, Neufchatel, Switzerland, for Chronometer.

Goldbacker, M., U. S., for Opera Glasses.

Gavard, Adrien, Paris. France, for a Pentograph.

Gray and Keen, Great Britain, for Barometers, &c.

Goullet and Frey, U. S., for injections of animal tissues for Microscopes.

Gurney, Jeremiah, New York City, United States, for fine Daguerreotyyes.

Holden, Dublin, Ireland, for Geological Maps.

Harrison and Hills, Brooklyn, U. S., for Daguerreotypes.

Hall, H. B., Malden, Massachusetts, U. S., for Gold Filling in natural teeth.

Jerome, A. S., New York City, U. S., for Cheap Clocks.

Kalb, P. G. Jr., Nürnberg, Zollverein, for Optical Instruments.

Kissam and Co., New York City, U. S., for Balances for Drugs.

Long, E., St. Louis, Missouri, U. S., for an exquisite Daguerreotype of a lady.

Laureau, L., Paris, France, for external beauty of Clocks.

Lequin and Yersin, Neufchatel, Switzerland, for new Escapement.

Mead, Bros., New York City, U. S., for Daguerreotypes, of "Seven Ages of Man.

Mallard and Napier, New York City, U. S., for Gas Burners.

Mirand, sen., Paris, France, for Microscopes.

Moissinet, Dobyns and Richardson, New Orleans, U. S., for Daguerreotypes.

Matile, H. L. jun., Neufchatel, Switzerland, for Pocket Chronometers and Watches.

Myers and Co., Philadelphia, U. S., for Gold Scales, (with special mention.)

North, W. C., Cleveland, U. S., for Daguerreotypes.

Oomkjns, E., jr., Groningen, Holland, for Maps and Atlases.

Patek, Philippe and Co., Geneva, Switzerland, for Watch Cases.

Perret, Augustin, Neufchatel, Switzerland, for Independent Seconds Watch.

Peter Otis, F., New York City, U. S., for Stereoscopes.

Powell, Dublin, Ireland, for Maps of Ireland.

Person and Brockett, New York City, U. S., for a Numerating Register for Omnibusses.

Palmer and Brown, Fitchburg, Massachusetts, U. S., for a double set of Teeth.

Ringard, Paris, France, for Opera Glasses.

Rohr, Ferdinand, Argovie, Switzerland, for Drawing Instruments.

Ross, Jonathan A., St. Louis, U. S., for Platform and other balances,

Riddle, F., U. S., for Marine Clock.

Racine, John A., Neuchatel, Switzerland, for Enameled Dials.

Reynolds, R. T., M. D., Philadelphia, U. S., for superior workmanship in Mechanical Dentistry.

Root, M. A., Philadelphia, U. S., for fine Daguerreotypes.

Reimer, Diedrich, Berlin, Prussia, for Astronomical Apparatus.

Rowell, Warren, New York City, U. S., for Artificial Palate.

Shea, Roland and Co., New York City, U. S. for Levelling Instruments.

Tirone, E., Turin, Sardinia, for Topographical Picture.

Thayer, Bridgman and Co., New York City, U. S., or Geographical Maps.

Warner, Benjamin S., London, England, for beauty of workmanship of two models of miniature size Steam Engines (with special approbation).

Whitehurst, J. H., Baltimore, U. S., for fine Daguerreotypes.

Jury G.

Classes 11, 12, 13, 14, and 15.—Manufactures of Cotton, Wool, Silk, Flax and Hemp, Mixed Fabrics, Shawls, Vestings, &c.

Jurors.

AMORY EDWARDS, Esq., Chairman, New York.

JULIUS GRIOLLET, Esq., New York.
F. A. CONCKLIN, Esq., New York.
G. W. CUSHING, Esq.
O. ZOLLIKOFFER, Esq.
W. VERMUHLEN, Esq.
JAMES IRWAN, Esq.
N. SULLIVAN, Esq.
B. L. CORSS, Esq.
J. H. WATSON, Esq.
JOHN HUTTON, Esq.
JOHN ATWILL, Esq.
H. D. H. THOMSON, Esq.

N. KINGSBURY, Esq., Connecticut.

Silver Medal.

Newport Silk Factory, Kentucky, for perfection and general excellence in the manufactures of Silk, of native production, from the cocoon.

Bronze Medal.

American Cordage Company, New York City, for general excellence of patent Cotton Cordage, particularly smaller sizes.

Amoskeag Manufacturing Company, Manchester, N. H., for Denims and Cotton Flannels, for general excellence.

Admanson, John, Dundee, Scotland, for improved Canvass, Dowlas. and striped, plain and unbleached imitation Russia Sheeting.

American Print Works, Fall River, Massachusetts, for best style and execution of Fancy Matter Prints.

Abercrombie and Yuill, Paisley, Scotland, for the best printed barege long and square shawls, and high commendation for the style of Printing.

Albrecht, Robert, Chemnitz, Saxony, for Upholstery Materials of superior execution, in Silk Brocade and Silk and Woolen Reps.

Buffington, Nathan, Fall River, Massachusetts, for Sewing Thread, for regularity of twist and colour.

Bertine, Peter J., Executor, New York City, for Mosquito Nettings and Foundation Muslins, for regularity of texture.

Ballard, Vale Co., Ballard Vale, Massachusetts, for all wool Flannels, of superior finish.

Bay State Mills, Massachusetts, for coloured Flannels, the best exhibited; for mixed Cassimeres, superiority of quality and finish; and for heavy wool Beaver Cloth, the best exhibited.

Boggio, Prosper and Co., St. Etienne, France, for splendid Watered Ribbons and Embroidered Trimmings for Dresses.

Bliss, William, Chipping Norton, England, for Kersey Checks for horse clothing, the best exhibited.

Bull and Wilson, London, for fancy Cassimeres, Cloths, and Beavers (the Mixed Cloths with special commendation).

Brown, T. and H. and Co., Selkirk, Scotland, for Scotch Tweeds, superiority of manufacture and excellence of design.

Burgess, Alfred and Co., Leicester, England, for various kinds of Woolen Yarn, Wool in various shapes of manufacture, far the best exhibited.

Boettger, B., jr., Leisnig, Saxony, specimens of Twilled Cloth, for excellence of manufacture.

Bormann, F. A., Goldberg, Silesia, for cloths of medium quality, for excellence of manufacture and cheapness of production.

Bergmann and Co., Berlin, Prussia, for samples of fine Berlin zephyr worsted, for great variety and excellence of colours; Yarns, of nearly 1500 tints.

Bouillier and Co., France, for the best French Blankets exhibited.

Bruhm and Nagler, Gera, Reuss, for specimens of dyed Merinos.

Booth and Pike, Manchester, England, for imperial Plush for hats, bonnets, &c., tips for hat linings, superiority of manufacture.

Brown, William, Halifax, England, for Table Covers of superior quality.

Backoven and Vollschwitz, Zerbst, North Germany, for Black Silk Plush of superior make and lustre.

Brocking and Ebeling, Viersen, for Embroidered Silk Vestings, very rich figures.

Bonnal, V. and Co., Montauban, France, for Bolting Cloths of superior quality.

Brosse and Co., Lyons, France, for best Plain Velvet Ribbon.

Baumann and Streuli, Horgen, Switzerland, for superior make of Grode Orleans Silk.

Bennett and Adams, Ballydevitt, Ireland, for Linen of exceeding fineness and evenness of texture.

Bertrand, Brother and Henri, Paris, for Linen Lawns, lithographic printed Handkerchiefs and plain Lawns ditto.

Boniface, N. and Son, Cambray, France, for Linen Lawns of exceeding fineness and beauty of finish.

Blais Fils, Letellier and Co., Havre, France, for tarred Hemp Rope of superior finish.

Burbach Brothers, Gotha, Saxe Gotha, for superior Hemp Fire Engine Hose, of great length, woven without seam.

Ballard Vale Co., Massachusetts, for Flannels, Silk and Wool for fineness.

Bossi Giuseppe, Vienna, Austria, for De Laine Fabrics, great novelty of design, and good execution in block-printing; and for block printing on Foulard Silks, the best work and most brilliant colours on this fabric exhibited.

Busse Brothers, Potsdam, Prussia, for specimens of heavy made Cloth.

Conestoga Steam Mills, Lancaster, Pennsylvania, for heavy Brown Sheetings, for weight and durable qualities.

Clark, John, jr., and Co., Glasgow, Scotland, for Sewing Cotton—general excellence.

Carr, T. and W., Tiverton, England, for Patent Wool Beavers, impervious to rain, but perfectly free for perspiration; Elastic Summer Woolen Goods, for superiority of quality.

Cherest and Buisson, Bischwiller, France, for samples of Black and Blue Amazon Cloths, for cheapness of production.

Crossley, Charles W., New York City, for rich Drapery Tassels and Upholstery Trimmings.

Coventry Ribbon Manufactory, Coventry, England, for Ribbons, for richness and perfection in manufacture.

Chichizola, G., Turin, Italy, for Velvet Stuffs of general superiority in colours and manufacture.

Cattaneo and Petiti, Turin, Italy, for Silk Stuffs, for beauty of design and perfection of manufacture.

Cocheco Co., for intrinsic value and superior excellence in Engraving.

Dewar, D., Son and Sons, London, for richly printed Table and Pianoforte Covers, for superior printing and quality.

Dietsch, J. G. and Co., Strasburg, France, for specimens of fine Cloths.

De Keyser, Michel, Brussels, Belgium, specimens of fine Woolen Blankets.

Diergardt, Fred., Viersen, near Crefeld, Prussia, for Velvet Stuffs,—for cheapness of production and superiority of finish, and extra wide shawl Velvets.

Donat, A. and Co., Lyons, France, for rich embroidered Vest Patterns.

Dunbar, Dickson and Co., Gilford, Ireland, for Bleached Linen Sheetings and Pillow Linens of various width.

Delame-Lelievre and Son, Valenciennes, France, for copperplate printed and hem stich Lawn Handkerchiefs, and for Cambric Handkerchiefs printed in gold.

Dunbar, McMasters and Co., Gilford, Ireland, for superior specimens of Linen Thread of various kinds and colours.

Dunnell, Jacob and Co., Providence, Rhode Island, for general excellence in printing Steam and Madder Colours, on Foulard Silks, Lawns, Barege, &c.

Danneberg and Sons, Eilenberg, Prussia, for Furniture Prints of superior execution and style.

Defferari Brothers, Genoa, Italy, for the best extra wide Shawl Velvet.

Earley, Edward, Whitney, England, for Whitney Blankets, made from English Wool.

Eagle Manufacturing Co., Seymour, Connecticut, for Silk Brocatelles and Carriage Drapery of superior quality, perfection in colours and beauty of design.

Fiedlers, Ferd., jr., Oederan, Saxony, for specimens of heavy made Cloth.

Feaux and Riedel, Aix-la-Chapelle, Prussia, for Twilled and Single Milled Cloths, and Cassimeres, and Silk mixed ditto.

Fauferrot and Dulac, Belleville, France, Specimens of Table Covers,—the best exhibited from France.

Fabian, C. G., Breslau, Prussia, for unbleached damask Table Cloths and Napkins.

Fudickar, H., Berlin, Prussia, for Horse Hair Cloths of good patterns and manufacture.

Forstmann and Huffman, Werder on Ruhr, Prussia, for Black and Coloured Cloth of fine quality, the colours are worthy of special commendation.

Fogliardo, Jean Baptiste, Melano, Switzerland, for superior specimens of raw silk.

Forbin, Boutellier, Beauvais, France, for various specimens of Felt Cloth and Piano Forte Felt.

Glasgow Mills, Springfield, Massachusetts, for Ginghams, for excellence of fabric and distinctness and permanence of colours.

Gubquier and Co., Ghent, Belgium, for Cotton Yarns, for general excellence.

Guillot and Co., Turin, Italy, for rich Velvet Lace.

Ghiglieri, Carlo, Milan, Austria, for black Silks of superior finish and general excellence in the manufacture.

Grosvenor, William, Kidderminster, England, for superior Brocade, Brocatelle, and figured Damask.

Grassot and Co., Lyons, France, for bleached damask Table Cloths, and Napkins of neat designs.

Gevers and Schmidt, Goerlitz, Saxony, for black and coloured cloths of medium quality,—the short face and finish worthy of special commendation.

Grosjean Hofer, Paris, for Printing on Mousseline de Laine, for design and fine execution.

Greutler and Reister, Winterthur, Switzerland, for superiority of execution in full Chintz Printing, and brilliancy of Turkey Red on Twilled Cottons.

Gilbert, George H., Ware, Massachusetts, for specimens of Wool Flannels, and all Wool Gauze Flannels of superior excellence.

Geissler, Ernst, Görlitz, Saxony, for black and coloured Broad Cloths of medium quality.

Grafe and Neviandt, Elberfeld, for Vestings, Cashmere, &c., for excellent fabric and styles.

Grosjean, Hofer, Paris, for printed Mousseline de Laine; the best goods exhibited.

Gurney and Co., New York City, for beauty of Colours, and perfection of the manufacture of Silk.

Grout, J. and Co., London, for Crape and Crape Lisse, for beauty of colours and general perfection.

Grellou, Henry, Paris, for Buttons, for variety of style, and relative cheapness.

Hadley Falls Mills, Hadley, Massachusetts, for Cambrics, Jaconets, Brilliants, and Lawns, for superiority of fabric.

Haile and Todd, Hinsdale, New Hampshire, for American Cashmerettes, superior quality and finish.

Haberland, G. A., Finsterwalde, Prussia, for Doe Skins, superior excellence of manufacture.

Hilger, Brothers, Lennep, Prussia, for black twilled Cloth, for fineness of thread, and excellence of manufacture.

Haussman, Aug., Brandenburg, Prussia, for fine Cloth for Ladies' Mantles, and fancy double Beaver Cloth; the Beaver Cloths are the best exhibited from Germany.

Hoogeboom, J. H. and Son, Leyden, Holland, for Blankets of fine Dutch Wool.

Houldsworth, J. and Co., Manchester, England, for figured Silk Fabrics, for richness and elegance of design, and general excellence of quality.

Huber, B. and Co., Paris, Hat Plush of superior finish.

Heiniger, Jacob, Bourgdorf, Switzerland, for Cotton and Wool Canvass, for cross-stich Embroidery and Cotton Java Canvass.

Hotchkissville Manufacturing Co., New York, for the best woolen printed square Shawls, of beautiful design and colours.

Hamilton Woolen Co., Southbridge, Massachusetts, for printed Cashmeres and De Laines, for superior execution and brilliancy of colours.

Hamilton Woolen Co., for Woolen Furniture Cloths, with special commendation for fabric, and superior execution in printing ten colours.

Hartmann and Fils, Münster, France, for style, execution, and beautiful effect on Jaconets, Bareges, &c.

Hennequin, H. and Co., Paris, for rich broche long Shawls.

Jones, Richard, and Co., London, for Piano Felt Cloth of all descriptions.

Jacobs and Behring, Crefeld, Prussia, for Satins, Silks, and Parasol Silks for general perfection.

Jenny and Schindler, Hard, Voralberg, for style and execution of printed Handkerchiefs.

Juhel, Desmares, Vivre, France, specimens of Woolen Cloth, excellence of manufacture and cheapness of production.

Krantz, J. J., and Son, Leyden, Holland, for Blue Cloth, with special commendation for quality and finish.

Koch Brothers, Lausig, Saxony, for Velvet Stuffs general excellence in manufacture.

Kuppers and Kindermann, Crefeld, Prussia, for figured and plain Silks and Satins, for brilliant watered Silks, and richly embroidered Satin Robes.

Knorr, Fred., Zweybrücken, Bavaria, for Hat Plush of superior quality.

Kelloo Dorastus, U. S., for best quality, and colouring of plain dyed woolen long Shawls.

Kauffman, Herman, Berlin, Prussia, for Furniture, Plushes, and Velvets, for large assortment and superior style in Plushes for Furniture.

Köchlin and Sons, Loerach, Baden, for Madder Prints, well dyed, and brilliant.

Lonsdale Company, Providence, Rhode Island, for coloured Silesias, for fineness of fabric and superiority in the colouring and finish.

Lamont, P. and Son, Nesmith and Co., Agents, New York City, for Bed Ticks, for fineness, weight, and general excellence.

Legrix and Bruyant, Elbeuf, France, for superior Beaver Cloth and fancy Cassimeres.

Lewin, Heinrich and Sons, Berlin, Prussia, for plain Satin Vestings of perfection of finish and manufacture.

Leblond, J., Paris, for best style of fancy Silk Buttons.

Lehmann, D. J., Berlin, Prussia, for Furniture, Velvets, Plushes, &c., for excellence in the manufacture and brilliant colours of the velvets.

Lawrence, Stone, and Co., Boston, Massachusetts, for the best embroidered Woolen Square Shawls, and for plain Woolen Long Shawls of remarkable beauty of design and excellence of manufacture.

Milledgeville Manufacturing Co., Milledgeville, Georgia, for Osnaburghs, for weight and durable qualities.

Masonville Manufacturing Co., Providence, Rhode Island, for fine Bleached Sheetings, for fineness and uniformity of texture and perfection of finish.

Malcolm and Hesketh, Patterson, New Jersey, for Cotton Quilts and Table Covers, for general excellence.

Milleville Manufacturing Co., Milleville, Massachusetts, for Cassimeres of various colours, general superiority.

Middlesex Company, Massachusetts, for Doe Skins, and Fancy Mixed Cassimeres, with special commendation for fineness of thread and superiority of manufacture.

Moerman, Van Laere, Ghent, Belgium, for boiled linen Duck and Canvass, of unusual width.

Morand and Co., Gera, for Drap d'Eté and Cuire de Laine, for superior excellence of manufacture and softness of finish.

Milson and Clark, Manchester, England, fancy Damask Silk Robes, for elegance of design and perfection of manufacture.

Menghius Brothers, Aix-la-Chapelle, Velvet Ribbons, stamped and plain, for superiority of manufacture.

Michelin Theodore, Paris, for Ribbons, richness, and general excellence in style and manufacture for fancy Velvet, Gauze and Taffeta.

Mauppin, Gerard and Houdard, Lyons, France, for Velvet Silk Robes, elegantly embroidered; and for rich figured Silk, the best in style and quality.

Musy and Galtier, Lyons, France, for Silk Velvet Stuffs, for firmness of texture, beauty of colours, and perfection of manufacture.

Montessuy and Chomer, Lyons, France, for general excellence in production of variety of Silk Fabrics.

Murland, Henry, England, for the best Fronting Linen.

Merlie, Lefevre and Co., Ingouville, France, for superior White and Tarred Hemp Rope.

Manchester Print Works, Manchester, N. H., for superior De Laine Fabric.

Merrimack Company, for best made fabric for Prints and superior Pinks and Purples dyed with French Madder.

Meyer J., Fils, Wisskingen, Switzerland, for General Execution of various fabrics, with great novelty in styles of Turkey Red Printing.

Meyer, J. A. and Co., Berlin, Prussia, for best Waistcoat Plush, and general excellence in manufacture of Silks and Satins.

Nellessen, C., Aix-la-Chapelle, Prussia, for specimens of superfine twilled Cloth, for excellence of manufacture and superiority of finish, worthy of special commendation.

Nichols, W. E. and Co., Moodus, Connecticut, Cotton Seine Twine and Cords, for strength and evenness of twist.

Newstadter, Jacob, New York City, for general excellence in Upholstery Silk Damask.

Oehme, C. W.. Berlin, Prussia, for the most advantageous Umbrella Silks.

Paul, James, Glasgow, Scotland, for embroidered Muslins, Robes, and Ginghams, for superiority of texture, beauty of design, and excellence of colouring.

Parker, Wilder and Co., Boston, Massachusetts, from Cocheco Mills, for Blankets, with special commendation for superiority of wool and excellence of manufacture.

Platner and Smith, Lee, Massachusetts, for the best Satinets exhibited.

Pease, Henry and Co., Darlington, England, for Worsted Yarns and Piece Goods, superior quality of piece goods.

Petzoldt, Frederick, Lengenfeld, Saxony, for Black Woollen Cloths, for excellence of quality and cheapness of production.

Patterson, J., Elgin Mills, Dundas, Canada, for specimens of Twilled Blankets. With special commendation as the best exhibited.

Pescia, F., Genoa, Italy, for Velvets and Damasks of general excellence of manufacture.

Pim, Brothers and Co., Dublin, Ireland, for Poplins, for style and execution.

Parodi, Brothers, Genoa, Italy, for brilliancy of Colour on Cotton Yarn (Turkey Red).

Reading Manufacturing Company, Reading, Pennsylvania, for fine Brown Sheetings, for evenness in thread and perfection in weaving.

Robertson, J. and Co., Glasgow, Scotland, for Jaconets, general excellence.

Rochdale Mills, for specimens of Blankets, of great excellence.

Rouques, A. Clichy, France, for superfine Cassimeres of all colours, for superiority of manufacture, and the colours are worthy special commendation.

Ratti and Crevelli, Milan, Austria, for perfection of finish and manufacture of Damask Figured Dress Silks.

Rey, A. Martinez and Co., Cadiz, Spain, for fine specimens of Raw Silk.

Richardson, J. N., Sons and Owden, Belfast, Ireland, for very fine and well made Linen, and for heavy Linens of excellent fabric; and for Bleached Double-Damask Table Cloths, combining great fineness, beauty of design, and excellence of manufacture.

Roy, James and Co., Watervliet, New York, for the finest Plaid Wool Long Shawls.

Rennie Robert, New York City, for Black and White and Black and Purple Madders, and Steam Printing on Lawns, and with special commendation for Furniture Prints, blocked fourteen colours.

Schellens, J., and Son, Eindhoven, Holland, for printed Cotton Handkerchiefs, for cheapness.

Salisbury Woollen Company, New York, for Silk and Wool Cassimeres of superior finish.

Slater and Sons, Webster, Massachusetts, for specimens of Black Cloth, with special commendation for superiority of quality and finish.

Seagrave, Jacob F. and Co., Burrilville, Rhode Island, for Doe Skins, for excellence of quality and finish.

Schlief, Samuel, Guben, Prussia, for Black Cloth of medium quality, for excellence of manufacture, worthy of special commendation.

Stauss and Leuschner, Glauchau, Saxony, for Saxony Wool Plaids, for superiority of style.

Schoeller, Leopold and Sons, Düren, Prussia, for Woollen Cloths of various colours and qualities, with special commendation; the coloured cloths equal to any exhibited.

Simon, A. C., for Fancy Lima Cloths of superior quality.

Simonis, Ivan, Verviers, Belgium, for Broad Cloths ¾ wide, Doeskins and Billiard Cloths. Special commendation of superiority of quality and finish.

Sentis and Son, Rheims, France, for specimens of Woollen and Worsted Yarn, for superiority of quality and evenness of spinning.

Scheibler and Co., Crefeld, for Black Silk and Velvet Ribbons, for superior black gros grain silk, and with special approbation, the coloured and black silk velvet and velvet ribbons.

Stieff and Harras, Potsdam, for Woven Pictures of Grotto, of Neptune, and beauty of design and perfection in weaving.

Staub, Brothers, Switzerland, for perfection in manufacture of Black Figured Silks, and for Woven Picture of the Crystal Palace.

Singaglia, Salomon, Busca, Italy, for superior specimens of Organzines.

Scales and Herbert, Newark, N. J., for Huckaback, Diapers, Medicated Rubbers, Linen Sheetings, Crash and Grass Cloth. An exhibition of rare excellence.

Sirot and Co., Paris, for the richest and finest Long Shawls.

Salisbury Manufacturing Company, for silk warp Codringtons, for style of fabric.

Schuffner, C. W., Glanchau, for Furniture, Damask, and Table Covers, for excellent style and fabric in worsted and silk damask.

Schmidt and Co., Brussels, Belgium, for Pantaloon Stuffs, for brilliant style and execution.

Stirling, William, and Sons, Glasgow, Scotland, for general execution, style and brilliancy of Turkey Red Colour, particularly on Velvet, which is specially noticed.

Steiner, Charles, Ribeauville, France, for superior brilliancy of plain colour Turkey Red in Cotton Fabrics, especially in printing two Reds on Shawls and Handkerchiefs.

Salzer, Carl, Vienna, for brilliancy of colour on Cotton Yarn (Turkey Red).

Thilo, A. G., Riga, Russia, for heavy woollen Overcoating fine black twilled Cloth, with special commendation for quality. The black twilled Cloth is one of the best exhibited.

Thomas, Brothers, Avignon, France, for coloured Florences, for perfection in colour and manufacture.

Travaglino, J. A., and Son, Haarlem, Netherlands, for excellence of East India Silk Stuffs and Sewing Silk.

Tasca, G. G., Turin, Italy, for superior finish of black silk and satin Tunics.

Trendels, J. J., jun., Culmbach, Bavaria, for very fine and well made Linen Drillings.

Tischendorf, Callenberg, Saxony, for Vestings, Quiltings, &c., for superior style of fabric.

Union Manufacturing Company, Norwalk, Connecticut, for worsted felt Beavers. Superiority of manufacture, and worthy of our special commendation.

Vassalboro' Manufacturing Company, Vassalboro', Maine, for black Cassimeres, of great excellence.

Von Bruck, H., and Son, Crefeld, Prussia, for fancy figured silk and velvet Ribbons.

Von der Muhill, Bro., Basle, Switzerland, for black Silk, for weight, lustre, perfection in manufacture and relative cheapness of (semper idem) black silks.

Von der Muhill, Bro., for beauty in Colours, perfection in manufacture and cheapness of coloured Gros de Naples.

Valeriani, E., Florence, Italy, for excellent finish to black Italian Cravats.

Van Beefting and Co., Katwyk, Holland, for Concentric or Equal Drawing Rope, of superior workmanship and pliability, particularly adapted for large hawsers for steamers.

Wattine, Prouvost, Roubaix, France, for rich Satin Cloth of various colours, for superior excellence of manufacture. The colours are the best exhibited.

Wortendyke and Co., Godwinville, New Jersey, for Candle Wick for general excellence.

Wethered Bros., Wetheredville, Maryland, for black Doe Skins, Cassimeres, for excellence of manufacture.

Wilson, George, Hawick, Scotland, for Shepherd Plaids, Tweeds, and Travelling Plaids, superiority of Shepherd Plaids, and excellence of other articles.

Weissflog, Ernest F., Gera, Reuss, for Merinos, Mousellines and Satin de Laines, superiority in quality and excellence in colour.

Warmont, E., Neuilly, France, for Woollen Scarfs, and Wool in Skeins, for superiority of fancy dyeing.

Wright, S. and Son, Philadelphia, Penn., for Oiled Silks of superior quality.

Walters, S. and Sons, London, for general excellence in manufacture of Cloak Plushes.

Wegner, J. R., Basle, Switzerland, for perfection in colours of Silk Fabrics.

Woedl, Gorgias, and Co., Vienna, Austria, for excellent hand-spun and hand-wove Damask Table-cloths, Napkins bleached and unbleached, Linen Drillings, and Silesian Shirtings and Sheetings.

Wilmer, Cannell, and Co., Philadelphia, Penn., for superior Madder and Fancy Styles, and printing on Silk Handkerchiefs.

Weyermann A., Elberfeld, for Coloured Yarns, Turkey red and rose colour, beautiful in colour and even in dye.

York and Sheepshanks, Leeds, England, for specimens of Black Cloth, for excellence of manufacture.

York Street Flax-Spinning Company, Belfast, Ireland, for Printed Linen. Lawn, padded and discharged and printed Linen Drillings.

Zuuerdeeg, J. and Son, Leyden, Holland, for Blankets made of Dutch Wool, excellence of manufacture.

Zaalberg, J. C. and Son, Leyden, Holland, for Blankets, with special commendation.

Honourable Mention.

Alderbrook Mill, Eaton, New York, for fine black Cassimeres.

Amos, Jaques, Wasselonne, France, for Woollen Fabrics and Shoes for Sailors.

Arntzenius, G. A., Goor, Holland, for uniformity of texture, unbleached Cotton Sheetings.

Atlantic Duck Co., East Haddam, Mass., for superior quality of finish of Cotton Duck.

Brocking and Eberling, Viersen, for plain Satin Vestings.

Bonnal, V. and Co., Montauban, Tarn and Garonne, France, for specimens of white and yellow Raw Silk.

Baumann, J. Streuli, Switzerland, for excellence in productions of Black Satins, and Black and Coloured Silks.

Beyers, Widow, and Co., Zittau, for good execution and intrinsic value of Linen and Cotton Damask Table Cloths.

Broadbrook and Co., for specimens of Fancy Cassimeres.

Bay State Mills, Lawrence, Mass., specimens of Blankets.

Broesel, Edward, Greiz, Reuss, for various coloured Thibets and Mouseline de Laine, &c.

Berge Verdure, Tournay, Belgium, for Worsted Goods.

Bouchard, Madame, St. Valliere, Canada East, for excellent Home-made Linen.

Bongaerts, P., Antwerp, for Hemp Bagging and Cowhair Carpet.

Brook, Jonas and Brother, uniformity and strength of Sewing Cottons.

Barbour, Wm. and Sons, Lexbourn, for superior quality of white and coloured Sienen Threads and Shoe Thread.

Bossi, Giuseppe. Vienna, Austria, Barege Shawls.

Crossley, Charles, New York City, for superior Sewing Silk and Tassel Fringe.

Courtauld, Samuel and Co., London, for excellence of Black and Coloured Crapes.

Colsman Bros., Langenberg, Prussia, for perfection in manufacture of medium quality of Satins and Cravats.

Chilliat, Edouard, Paris, for beautiful shades of Sewing Embroidery, and Netting Silks.

Couturier, A. and A. Renault, Paris, for perfection in in manufacture of Hat Plush.

Capper, Son, and Co, London, for unbleached Damask Toilet Covers, excellent design and fabric.

Cramsta, C. J. and Son, for Croquillas of fine quality.

Corson, David, and Son, Arbroath, Scotland, for boiled flax Sail Cloth.

Conestoga Steam Mills, for cheapness and durability of Cotton Blankets.

Dewar, D., Son and Sons, London for Unbleached Linen and Silk Damask Table Covers.

Dunbar, Dickson, and Co., Gilford, Ireland, for heavy and light Shirting Linen.

Dewar, D., Son and Sons, London, for large variety of good Damask Table Cloths, Napkins and Linen Floor Cloths.

Dawbarn, William, for uniformity of texture of Bleached Shirtings.

Edwards, A. and D., and Co., Dundee, Scotland, for superior low cost linens,

Ehinger Bros., Oberlangenau, Bohemia, for durability and good execution in Waistcoatings and Mixed Goods.

Ferguson, J. S. and Co., Belfast, Ireland, for superior low priced Linens.

Forster, S. S., for Indian Cloths.

Fournier and Barbot, France, for Woollen Blankets.

Genoie, and Co., for production of Silk Stuffs.

Guillot, J. and Co., Turin and Genoa, Sardinia, for his production of Plain and Damask Velvet.

Gihon, William and Sons, Ballymena, Ireland, for superior low priced Linens.

Gundy, Joseph, and Co., Bridgport, England, for Seine and Gilling Twine of superior finish and quality.

Gavin, Peter and Son, Leith, Scotland, for superior Flax Sail Cloth.

Gilbert. George H., Ware. Massachusetts, for styles Silk' Warp, Gauze Flannels and Flannels.

Groche and Son, Görlitz, Germany, for Woollen Cloths.

Grillmayer, J., for evenness and finish of Cotton Twist.

Hall and Nichols, fancy Silk Trimmings of various styles.

Hamilton, Hyde, and Co., London, England, for Window Valance, and Fancy Silk Fringes and Gimps.

Koch Brothers, Lausig, Saxony, for excellence in manufacture of Waistcoat Plush.

Kuppers and Kindermann, Crefeld, Prussia, for production of Black Figured Silks.

Kumpan, J. G., Vienna, Austria, for broche Shawls and Scarfs.

Landwehr, Heinrich, Berlin, Prussia, excellence of manufactory of cravats and vest patterns.

Loewen, S. and Co., Brandenburg-on-the-Havel, Prussia, for Woolen and Figured Stuff for Ladies' Cloaks.

Lang, J., Vienna, Austria, for durability of texture of Fancy Cambrics.

Lebel, L., Soissons, France, for Flat Rope for Mines, of superior workmanship and quality.

Milson and Clark, Manchester, England, for excellence in manufacture and finish of Black Gros de Rhine Silk.

Menghius Brothers. Aix-la-Chapelle, Prussia, for coloured Velvet Stuffs.

Mauppin, Gerard and Houdard, Lyons, France, for excellence in manufacture of Chameleon Poult de Soie Silks.

Musy and Galtier, Lyons, France, for superior make of Black Silk Serges.

Manchester Print Works, New Hampshire, for brilliancy in effect in Printing.

Marsh, G. W., Pascoog, Rhode Island, for make of fancy Cassimeres, Cotton Warp.

Marx and Weigert, Berlin, for general exhibition of articles, and particularly Stamped Furniture Plushes.

Mengen, Christian, Viersen, near Crefeld, Prussia, for Printed Furniture, Velvets, and articles generally.

Mayer, T. B., Grünberg, Silesia, for Satins de Laine.

Mueller, A. F., Mülhausen, Prussia, for fancy Coatings and Buntings.

Maréchal and Sœur, Sedan, France, for Woollen Cloths.

Mengen, Christian, Viersen, near Crefeld, Prussia, for Striped Linen for Carriage Furniture.

McMullen, John, for Cotton Seines and Fishing Nets.

Negretti, Perego, for merit in production of coloured Silk Stuffs.

Normand, James, Kirkaldy, for superior quality of Linen Sheetings.

Pomeroy, T. and Sons, New York City, for Broadcloths with Cotton Warp.

Perkins Mills, Akron, Ohio, for fine Sattinets.

Pintus, H., jun., and Co., Brandenburg, embroidered Lama Cassimere, and other stuffs.

Paret, M., Sedan, France, for Broadcloths, Kerseymeres, &c.

Pols, J., Leyden, Holland, for Blankets.

Parker, Wilder and Co., for heavy wide bleached Sheetings.

Ruffer, S. B. and Son, Liegnitz, for imperial Woollen Cloths.

Stieff and Harrass, Potsdam, near Berlin, for elegant embroidered Vest Shapes and Figured Cravats.

Stewart, A. T. and Co., New York City, for beauty of design in choice styles of Ladies Dress and Cloak Silks.

Staubli, Jules, Horgen, Canton, Zurich, for fine finish of Black Gros de Rhine.

Schiffner and Zimmermann, Glauchau, for good style in Worsted and Cotton Fabrics.

Schwedler, and Son, Leipsic, for Buckskins and Printed Table Covers.

Schweitzer and Heller, Greiz, for black Thibet Cloaks, Cashmeres of different colours, &c.

Schimpff and Gladitsch, Gera, for Fine Thibet Cloth.

Samson, E., Ludwig and Emil, Silesia, for Cloths, and 6-4 Fancy Cassimeres.

Samson, Hugh and Co., Dundee, Scotland, for Linen Netting and Cheese Cloths.

Saunders Cotton Mills, for merit in Spinning and Weaving.

Thomas Brothers, Avignon, France, for excellence in manufacture of Bonnet Satins.

Tasca, G. G., Turin, Sardinia, for perfection in manufacture of Velvets.

Tasch, G. A., Glauchau, Saxony, for good styles of Goods, Silk and Wool, all Wool, &c.

Tasch, G. A., Glauchau, Saxony, for Saxony Wool Plaids.

Thursby, John and Son, New York City, for Cordage and Lines of superior workmanship and finish.

Ullathornes and Longstaffs, London, for superior quality of Shoemakers' and Sadlers' Thread.

Van Catz, J. P., Gouda, Holland, for various articles of Braided Hemp of superior workmanship.

Williamsville Co., for brown and blue Shirting for fineness and durability.

White Rock Co., for superior fine Shirtings.

Winnepauk Mills, Norwalk, Connecticut, for samples of Woolen Felts.

Wamsutta Mills, for Bleached Sheetings, fineness and uniformity of fabric.

West Stafford Linen Co., for superior quality of Shoe Thread.

Wilson, George, Hawick, Scotland, for Gentlemen's Plaid Woolen Long Shawls.

Zuppinger, H. de G., and Co., Eichthal, Canton Zurich, for quality of embroidery Silk.

Zschille, O. C. and H., Frankfort on Oder, for Coloured Cloth and Fancy Cassimeres.

Jury H.

Classes 16 and 20.—Leather, Furs and Hair, and their Manufactures; Gentlemen's Wearing Apparel.

Jurors.

GEORGE TABER, Esq., Philadelphia, Chairman.
JOHN C. LORD, Esq., 164, Water Street, Secretary.

WOOD GIBSON, Esq., 362, Broadway.
CHARLES FIELD, Esq., Philadelphia.
DAVID SAMUEL, Esq., Philadelphia.
SETH BOYDEN, Esq., New Jersey.
F. LUDWIG, Esq., St. Petersburgh, Russia.
CHAS. M. LEUPP, Esq., New York.
WILLIAM HOYT, Esq., New York.
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JOHN F. PRAY, Esq., Boston.
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CHARLES ST. JOHN, Esq., New York.
LORIN BROOKS, Esq., New York.
W. G. HUNT, Esq., New York.
JOSEPH CRISTADORO, Esq., New York.
WILLIAM BACHELOR, Esq., New York.
E. W. TRYON, Esq., New York.
C. F. LIVERMORE, Esq., 44, Ex. Pl.
JOHN F. HENRY, Esq., 313, Broadway.
JOHN NEILL, Esq., Philadelphia.
WM. A. HALL, Esq., New York.
J. M. BURT, Esq., New York.

Silver Medal.

Bougard, Charles, New York City, for a case containing Hair Work, which, for all useful and practical purposes, is the best exhibited. We also find the said Charles Bougard entitled to honourable mention for inventing a new Machine for manufacturing seams for ladies' hair work, the first of the kind we have ever seen.

Coupin, Jerome, Dix Rhone, for the most beautiful display of Gentlemen's Felt Hats, made of very superior materials, of very superior workmanship, and coloured by a new process, combining utility with beauty.

Frothingham, Newell and Co., New York City, for the best ladies, misses and childrens' fine Gaiter Boots, fine Slippers, and fine cork-soled Gaiter Boots.

Lacey and Phillips, Philadelphia, Pennsylvania, for Collar in a case containing several sets of Harness, in very good taste, and well executed. Those gentlemen exhibit with their harness improved " Brigg's Patent Collar," for which they claim particular consideration for improvements made upon it by themselves.

Lassack, F. W. and Son, New York City, for the finest case of manufactured Furs, consisting of Russia Sable, Hudson Bay Sable, Ermine and Chincilla Capes, Mink Capes and Muff, a taped Russia Sable Tail Victorine, and a taped Stone Martin Cape. This award is made for the novelty of form of the Capes, the superior quality of the materials, and the masterly workmanship displayed in their manufacture.

McFarland, Owen, Newark, New Jersey, for a case containing several sets of Harness, which has been produced at very considerable cost, both of money and time. He has certainly displayed great taste and skill in the execution of the work, as well as good judgment in the selection of the materials.

Nathan, Beer, Trefousse and May, Paris, France, for superbly-dressed Kid Skins for gloves, beautifully coloured in a manner entirely new, and in great perfection.

Small, J. and Co., New York City, for a novel design of a Travelling Cap, which combines convenience with great utility.

Bronze Medal.

Bouvy, Alex., Liege, Belgium, for excellent Sole Leather and Boot Fronts.

Brochier, Pere and Fils, Grenoble, France, for an assorted lot of sheep skin Gloves, which are a very good article.

Bevington and Morris, London, for the best display of fancy skeep skin Rugs and Mats, displaying much skill in the arrangement of design.

Boulat, Fils, C., Paris, for a beautiful display of Coney and Hare's Fur, of superior quality.

Bailey and Shaw, Lenton, near Nottingham, England, for the superiority of finish and colour of their specimens of Morocco Skins and Chamois Leather.

Bartholme, F., Augsburg, Bavaria, for a superior manu facture of Vellum and Parchments.

Blache, and Megroz, Thonon, Sardinia, for superiority of finish of specimens of Varnished Calf Skins and general excellence of Undressed and Dressed Calf Skins.

Bayvet, Freres and Co., Paris, for specimens of Morocco and Kid, for excellence of finish and colour.

Benkart, Leonard, Philadelphia, Pennsylvania, for the best fine Calf Sewed Double-soled Waterproof Boots, the best fine Calf Sewed Dress Boots, and the best Men's Patent Leather Pump-soles.

Ball, Brigham, and Co., Boston, Massachusetts, for a superior case of Men's Heavy Boots, of a variety of styles, and admirably adapted for mining purposes.

Benedict, J. W., Galveston, Texas, for a pair of Men's Boots, made of Aligator Skin.

Clirehugh, V., New York City, for a case of Hair Work, the best in the case deserving commendation.

Chadwick, John and Co., Newark, New Jersey, for the general excellence of their specimens of Patent and Enamelled Leather of various colours.

Crawford, H. M., Philadelphia, Pennsylvania, for the general excellence of their specimens of Rough and Finished Calf Skins.

Courtois, E., Paris, France, for superiority of manufacture of Coloured Embossed and Gilded Leather.

Clever, James, Tannersville, Pennsylvania, for an Oak Tanned Butt. This specimen of sole leather is of superior manufacture in every respect—in solidity, firmness, and thorough tanning, and in everything that constitutes first rate sole leather. It is the best article in the Exhibition.

Chanay and Bouchet, Nantes, France, for specimens of Dressed Calf Skins, of excellent manufacture.

Clerc, A., Paris, France, for the best Patent Leather Military Boots.

Cantrell, S., New York City, for the best Ladies' Fine Patent Leather Riding Boots.

Candee, L., and Co., New Haven, Connecticut, for the best specimens of Men's, Women's, and Misses' Metallic Rubber Shoes.

Cahill, S., New York City, for the best Men's Patent Leather Cork-soled Boots.

Doerr and Reinhart, Worms-on-the-Rhine, for specimens of an excellent quality of patent Calf Skins.

Dietz, Edward, Barr, for superiority of finish of Wax Calf.

Deadde, L., Paris, for superiority of finish of Coloured Leather.

Deed, John S., London, for the superiority of the colour of his Morocco Leather.

Deed, John S., London, for best dyed Sheep and Lamb Skins, Rugs and Mats.

Dupratt, D., for the best Ladies' Hair Work on Exhibition in a case.

Fownes, Brothers, London, for Thread Gloves, for general excellence of manufacture.

Forr, J., Paris, France, for Gentlemen's Fine Boots and Gaiters.

Feter, C. H., Revière Ouelle, Canada East, for general excellence of specimens of Leather, from the Ouelle River, of the skin of the porpoise.

Gaulett, Aubry, and Dumarcet, Paris, France, for a splendid assortment of various qualities of Gloves

Glovers' Association, Prague, Bohemia, for Gloves, beautifully made, and which meet our special approbation.

Geyer, William and Edward, Eisenberg, Saxe Altenburg, for the general excellence of their specimens of Prepared Leather for instruments.

Gauthier, J., Paris, France, for an excellent article of Varnished Calf Skins.

Genin, J. N., New York City, for the best specimens of Silk Hats. These hats are made with materials of superior quality and well manufactured.

Do., do., do., for a case of Manufactured Furs. A Chinchilla Cape and a Stone Martin Victorine, are well worthy of special consideration.

Heintze and Freudenberg, Weinheim, Baden, for the general excellence of the specimens of Japanned Leather and Calf Skins, with special approbation.

Houette, A., and Co., Paris, for their specimens of Varnished Calf Skins, for superiority of finish and general excellence, with special approbation.

Hayse. Craig and Co., Louisville, Kentucky, for the best specimens of White Beaver Napped Hats, finished and unfinished, of rare quality and colour, superior lustre and fine workmanship; and for the best specimens of Childrens' Napped Felt Hats, of choice materials and make, and displaying much taste in the trimmings.

Hegl, Cornelius, Worms-on-the-Rhine, for specimens of an excellent quality of Patent Calf Skins.

Indians of Lorette, Canada, for general excellence of specimens of Dressed and Undressed Deer and Moose Skins, prepared by themselves.

Jorez, L., jun., Brussels, Belgium, for an excellent article of Varnished Coach and Harness Leather.

Knox, Charles, New York City, for a beautiful White Otter Napped, Unfinished Hat, of superior make, quality and colour.

Krach, Bros., Prague, Bohemia, for Gentleman's Shooting Dress complete, for superiority of workmanship and materials employed.

King, D. R., Philadelphia, Pennsylvania, for the best Ladies' Black Satin Riding Boots.

Lacroix, F., New Orleans, Louisiana, for Coats, Vests and Pantaloons, for superior excellence. These articles for taste, workmanship, and quality of materials, are the best in the Exhibition.

Lanza, G., Turin, Italy, for general excellence of specimens of Sole, Bridle, and Harness Leather.

McNeely, Philadelphia, Pennsylvania, for the general excellence of his specimens of Buckskins, for Pianos and Musical Instruments.

Manson, Nantes, France, for general excellence of Dressed Calf Skins and Boot Tops.

Mercier, Switzerland, for general excellence of his specimens of Heavy Waxed Calf Skins, being in all respects a very superior article.

Moretton, B., Paris, France, for a case of Ribbed and Plain Silk Hats, made of superior plush, and requiring, from the novelty of their design, much skill in their manufacture and taste in their trimmings.

Nys and Co., Paris, France, for an excellent specimen of Japanned Leather.

Nessel, C., Oedenburg, Hungary, for Coat and Waistcoat, the Coat being of the most elaborate workmanship exhibited, and the Vest remarkable for ingenuity of design and finish.

Oakford, Charles, Philadelphia, Pennsylvania, for the best specimens of Ladies' Riding Hats. These articles are made of good materials, well manufactured and tastefully trimmed.

Petit, Didier, A. St. Die, France, for the general excellence of his specimens of Wax Calf Skins.

Pilling, Thomas, and Co., Glasgow, Scotland, for the general excellence of their specimens of Saddlers' Basils.

Pollak, J. J., and **Sons**, Prague, Bohemia, for general excellence of their specimens of Dressed Calf Skins and Reindeer Leather.

Perego, Ira, and **Son**, New York City, for Cravat Ties, Stocks and Suspenders; for good taste and superior workmanship.

Phalon, E., New York City, for Hair-work in a case. Deserving of special mention.

Ramsberg and **Ebert**, Georgetown, District of Columbia, for Buckskin Gloves, the Leather of which is a very superior article, but Gloves not well cut.

Do., do., do., for the superiority of finish, beauty of colour, and general excellence of their specimens of Buckskins of various colours.

Rogers, E. T., Carbon County, Pennsylvania, for a pair of Gentlemen's Fine Calf, Pegged, Seamless Shoes.

Selmes, T. R., Hannibal, Missouri, (Hugh, A., and Co., Agents), for Gentlemen's Hunting and other Buckskin Gloves. A superior article.

Shaw, Benjamin, New York City, for the best Ladies' Satin Gaiter Boots, and the best Ladies' White Satin Slipper.

Smythe and Co., Dublin, Ireland, for specimens of Balbryggan Hosiery; for superior excellence of manufacture, deserving of special approbation, as the best in the Exhibition.

Schmidt, Goldenberg and Co., Liege, Belgium, for specimens of Woollen and Cotton Hose; for superior manufacture of Cotton Hosiery, and for excellence of materials employed.

Singer, Joseph, Pesth, Hungary, for an Elastic Dress Coat—for elaborate workmanship.

Smith, James R., New York City, for the superiority of finish and perfection of colour of specimens of Morocco, Coloured Linings and Sheep Skins.

Smith, Edmund A., New York City, for the excellence of finish and colour of his Bronze Kid, and the general excellence of his specimens of Morocco and Coloured Sheep.

Soucin, Cobbet, Chaumont, Haut Maine, for general excellence of Wax Calf Skins, with special approbation.

Suser, H., Nantes, France, for the superior manufacture of Waxed Calf Skins.

Tweis, John, Germantown, Pennsylvania, for specimens of Fancy Hosiery, and Worsted; for general excellence of manufacture.

Terray, Brothers, Paris, France, for Gentlemen's and Ladies' Gloves, Swedish and Fancy Kid; superior in workmanship and quality.

Texier, T., Jr., Niort, Dieux Serres, France, for Dressed Chamois, Calf and Deer Skins for Gloves; also an assortment of Sheep-skin Gloves; all of which are of superior quality.

Texier, T., Jr., Niort, Dieux Serres, France, for general excellence of Glove Leather.

Underwood, Godfrey, and Co., Milford, Massachusetts, for the best Men's, Boys', and Children's Coarse and Fine Boots.

Wolff, F., Hermanstadt, Transylvania, Austria, for superiority of manufacture of Goat and Sheep Skins.

Wörlen, Carl, Memmingen, Bavaria, for a Rug, made of 650 pieces of fur, joined together in so perfect a manner as to form a beautiful variegated Rug.

Wakefield Manufacturing Company, Germantown, Pennsylvania, for Fancy Hosiery, Scarfs, &c.; for superiority of manufacture of Fancy Worsted, and Silk Shirts and Drawers. The clearness of colouring and combination of same are considered worthy of especial notice.

Wolleb, F. E., Stolberg, Saxony, for specimens of Cotton Gloves and Hosiery, and Worsted Gloves; for excellence of manufacture.

Winter, Archibald, New York City, for a pair of Shoes without seam.

Zimmerman, Christian, Apolda, Saxe Weimar, for various Cotton and Woollen Hosiery, and Woollen Goods; for general excellence of manufacture; and recommend the Woollen Under Garments, and Children's Tunics, Hoods and Caps, as worthy of especial approbation.

Honourable Mention.

Alles, Philip, New York City, for Ladies' Fancy Embroidered Shoes and Gaiters.

Allegri, Antonio, Florence, Tuscany, for specimens of Boots and Shoes, ordinary work.

Brady John, New York City, for Gentlemen's fine Patent Leather Boots.

Brooks, Edwin A., New York City, for a case of Gentlemen's and Ladies' Shoes and Boots.

Bell, Thing, and Co., Boston, Massachusetts, for Woollen Under Garments and Hosiery. These goods are well adapted to general use.

Brodt, H., Philadelphia, Pennsylvania, for the superiority of finish of his specimens of American Calf Skins of French finish.

Corlies, John W., New York City, for excellent specimens of Men's and Women's Metallic Rubbers.

Chapelle, G., Paris, France, for a very good case of Boots, Shoes, and Slippers.

Cantrell, S., New York City, for a good variety of fine Shoes for Ladies, Misses and Children.

Delon-Alboy, Paris, France, for a good article of Waxed Calf Skins.

Dufosse, Paris, France, for a very creditable case of Ladies' Boots and Shoes.

Eisemann, Mayer, New York City, for Men's Patent Leather Boots.

Forno, Gio, Turin, Sardinia, for a full Dress Suit,—being the only articles of this kind from Italy.

Galibert, C., Milhau, Auvergne, France, for an elegant quality of Dressed Russet and Black Calf Skins.

Gittens, John K., Williamsburgh, New York, for transferable Waterproof Cork Soles for Boots and Shoes.

Gardner, O. W., Boston, Massachusetts, for Portsmouth Hosiery. These goods are of excellent colour and well adapted for common use.

Henn, John Edward, St. Louis, Missouri, for a pair of Men's Patent Leather Boots and Shoes; good ordinary work.

Hoessler and **Sons**, Rabenstein, near Chemitz, Saxony, for a variety of Hosiery, Cotton, and Thread Gloves, well manufactured.

Jackson Brothers, Liverpool, England, for a Satin Dress, Waistcoat, for ingenuity of design.

Johnson, Brothers, and **Townsend**, Manchester, England, for specimens of Gloves, Hosiery, &c. The Jury do not feel authorized in awarding a Medal, where manufacturers' names are not specified.

Jongmans, A., Leyden, Netherlands, for articles of Wearing Apparel; the best exhibited from Holland.

Kennedy, D., Reading, Pennsylvania, for samples of Chemically Tanned Leather without the use of bark.

Kaiser, G. C. F., Amsterdam, Netherlands, for Gloves made of various skins, such as Goat Skins, Sheep and Deer Skins beautifully dressed.

Kutchen George, New York City, for a case of Men's ordinary Boots and Shoes.

Lang Peter, New York City, for three pair of adjusting Spring Boots.

Magee, P., New York City, for Gentlemen's fine Patent Leather Boots, rotary heel.

Miller, J. B. and Co., New York City, for a very pretty case of Ladies' fancy Embroidered Shoes.

Morschel, Winzevried, and Co., Hernnhaag on the Maine, for cheapness of production.

New Brunswick Rubber Company, New Brunswick, N. J., for ordinary specimens of Men and Women's Metallic Rubbers.

Poirier, P., Chateaubriant, Loire Inferieure, France, for a very good case of Dress Gaiter Boots and Shoes.

Rigo and Kraetschmar, Rima Szombath, Hungary, for two Hungarian Shooting Jackets, well adapted to a rigorous climate, but principally remarkable as a fancy costume.

Stout, A. V., and Co., New York City, for Men's stout Calf Sewed Boots.

Viault-Este, Paris, France, for a good variety of Ladies' Fancy Boots, Shoes, and Slippers.

The following articles having been overlooked by the Jury, the Commissioners caused them to be examined by competent persons who awarded to—

Warming, E., Copenhagen, Denmark, for Furs, a Bronze Medal.

Baker, John A., New York City, for Military and Fancy Feathers, a Bronze Medal.

The Committee were unable to examine the following cases of Hats and Caps, as after several days' notice the cases still remained unopened:—Nos .9, Hats, Kellogg, J. W.; 32, Hats, Warnoick, R. and J.; 62, Hats, Leary and Co.; 84, Hats, Degin, F.

Jury I.

Part of Class 19 and Class 26.—Tapestry, Decorative Furniture and Upholstery, including Papier-Maché, Paper Hangings, and Japanned Goods; Marble Ornaments and Marbleized Irons.

WILLIAM GIBSON, Chairman.
GEORGE PLATT, Esq.
JOHN SARTAIN, Esq.

Silver Medal.

French Imperial Government Manufactory of Gobelins and Beauvais Tapestry, for originality and great beauty of their specimens.

Rogers, W. G., London. Great Britain, for Superb Specimens of Carving in Wood.

Smith, A. J., West Farms, New York, U. S., for Novelty of Invention, Elegance of Design and Colour, Economy of Material, &c., in Two-ply Ingrain Tapestry Carpets.

Smith, Dr. William, Philadelphia, U.S., for the Application to Useful Purposes of the Refuse Slags of the Iron Reducing Furnace.

Bronze Medal and Special Notice.

Balny, Jr., Paris, France, for General Excellence of Furniture.

Brooks, T., Brooklyn, United States, Excellence of Design and Execution of Walnut Buffet.

Delicourt and Co., Paris, France, for General Excellence of Paper Hangings.

Gruintgens, Eldest Son, Paris, France, for Superb Specimens of Upholstery Goods.

Giacomazzi and Brothers, Venice, for Superb Mosaic Tables of Glass Marble.

Levy, James, New York, United States. for Sculptured Chimney in Marble.

Meyer and Wried, Brunswick, Zollverein, for Artistic Japan Work.

Minton, Herbert, and Co., Stoke-upon-Trent, Great Britain, for Encaustic Tiles for Flooring.

Motelli, Gaetano, Milan, Italy, for Sculptured Marble Chimney-pice.

Rochefort and Skarren, New York, United States, for Carved Oak Buffet.

Roux, Alex., New York, United States, for General Excellence in Carved and Upholstered Furniture.

St. Helen's Glass Works, Lancashire, Great Britain, for Enamelled Glass Windows, large size, on Rough Plate.

Sallandrouze de Lamornaix, Paris, France, for Fine Aubusson Tapestry and Carpets.

Bronze Medal.

Aubanel, J., Paris, France, for Rich Aubusson Carpets, the Garden of the Amazons.

Aubanel, J., Paris, France, for Design and Execution by fine Gilding, of a large Iron Door.

Beaudouin Bros., Paris, France, for fine Specimens of Mosaics in Asphaltum.

Bigelow Carpet Company, by H. P. Fairbanks, Boston, United States, for fine Specimens of Power-loom Brussels Carpeting.

Braquenie, Alex,, Paris, for Fine Specimens of Velvet Pile Aubusson Carpeting.

Boni-Andrea, Milan, Italy, for Terra-cotta Chimneys, &c.

Bolton, John, Pelham, New York, United States, for Mosaic Window and Emblems on Stained Glass.

Bulkley and Herter, New York City, U. S., for Design and Workmanship of Oak Book Case.

Brackebusch and Herting, Hanover, for Fine Varieties of rich Paper Hangings.

Carew, John E., London, Great Britain, for Design and Carving of Altar Piece.

Ciando, G., Nice, Italy, for Fine Inlaid Wood Mosaic Picture Tables.

Connecticut Marble Company, New Haven, U. S., for Stained American Marbles.

Da Fieno, G. B., Genoa, Sardinia, for Carved Console Table and Mirror Frames.

Desfosse, Jules, Paris, France, for Large and Fine Tableau Decoration Paper.

Dessoir, Jules, New York, U. S., for Rosewood Bookcase and Carving.

Ellaers, A., Boston, U. S., for Delicacy of Carving from the Solid, on Oak Sideboard.

Flinn, Daniel, New York City, U. S., for Self-gravitating and Pendulating Bed for the Sick.

Galliena, G., Turin, Sardinia, for Decorative Carving.

Grovsteen and Truslow, New York City, U. S., for Japan and Pearl Inlaid Piano-Forte Case.

Descalzi-Campanino and Son, Genoa, Sardinia, for Inlaid Wood (the Ray Table).

Gerente, A., Paris, France, for fine Specimen of Fifteenth Century Church Stained Glas.

Hobe, Charles F. and Son, New York, U. S., for Design and Carving of Oak Extension Table.

Henderson and Widnell, Laswade, Scotland, for Fine Velvet Pile Tapestry and Moccatt Carpeting.

Holland, William, Warwick, England, Church Windows, Stained Glass, various periods.

Helger, Carl, Düsseldorf, Rhenish Prussia, for Fine Carved Ebony Writing and Work Table.

Jennens and Bettridge, London, Great Britain, for General Excellence of Papier Maché Furniture.

Jarosson, Leon, Jersey City, U. S., for the Application of Colours to Cloth, by means of a Mordant for Decorative Purposes.

King and Son, New York, U. S., for Recumbent Extension and Wheel Chairs.

Kennedy, John, New York, U. S., for Marble Chimney Style—Renaissance in low Relief.

Morant and Boyd, London, Great Britain, for Furniture Carved and Finished in Gold.

Morant and Boyd, London, Great Britain, for Rich Interior Decorations.

Mathews and Stacey, New York, U. S., for Fine Painted Chamber Furniture.

Newland, E. and Co., Philadelphia, U. S., for Good Design and Workmanship of Pier and Mantle Mirrors.

Plate Glass Works of Cirey de Monthermé, Paris, for Large Mirrors of Great Brilliancy and Perfect Purity of Colour.

Roche, Edward, New York, U. S., for Fine Specimens of Architectural Terra Cotta Enrichments.

Requillart, Roussel, and Chocqueil, Paris, for Fine Velvet Pile Moquet Carpets and Tapestry Furniture Coverings.

Ringuet, Leprince and Co., Paris, France, for General Excellence of Decorative Furnishings.

Ringuet and Co., for Carving and Gilding of Mirror Frame.

Spiers and Son, Oxford, Great Britain, for Rich Papier Maché and Japan Table.

Silesian Marble Co., New York, U. S., for Imitation Marble Columns, Mantles, &c.

Stewart, A. T. and Co., New York, U. S. for the Fine Specimens of Axminster Carpet manufactured for their house.

Trebbi, O., Rome, Italy, for Fine Mosaic.

Tomlinson, John, Ashford, Great Britain, for Rich Inlaid Tables.

Watson and **Hodgson**, New York, U. S., for Fine Specimens of Architectural Modelling.

Zeeger, F., Amsterdam, Holland, for Fine Japan Screens.

Zuber and Co., Rixheim, France, for fine Landscape Block-Printed Paper.

Honourable Mention.

Arrowsmith, Henry and **Arthur**, London, Great Britain, for Artistic Picture Pannels in Cabinet.

Berlin and **Ehrman**, Fürth, Bavaria, for Bevelled Edge Silvered Mirrors.

Bevington and **Morris**, London, Great Britain, for Cocoa Nut Fibre Carpeting and Matting.

Bray, Benjamin, Salem, Massachusetts, U. S., for a Patent Balance Spring Shade.

Bennet, C. F., St. John's, New Brunswick, for Slate for Building Purposes.

Benelli, G., Florence, Italy, for Fine Carved Frame.

Bangor Slate Quarries, North Wales, Great Britain, (by W. Dawborn,) for Large-sized Slates of Uniform Texture.

Boege, A., Berlin, Prussia, for Fine Imitation Gold and and Inlaid Frames.

Brandon, A. G., New York, U. S., for Good Specimens of Signs.

Beglon, J. R. and Co., Boston, U. S., for Good Satin Ground Paper-Hangings.

Black and **Gram**, New York City, U. S., for Fine Specimens of Gilt Mouldings.

Lawrence, Stone and Co., Boston, U. S., Bay State Mills, for Utility and Cheapness of Fine Printed Felt Goods.

Binet, Paris, France, for Fine Ebony and Rosewood Cellarets.

Bosi, Enrico, Florence, Italy, for Antique Ebony Cabinet with Fine Florentine Mosaic.

Burckhardt and Son, Berlin, Prussia, for Stencil Window Shades.

Bolton, John, New York City, U. S., for rich embossed Gold Writing on Glass.

Burgh, P. **Rodel** and Co., Paris, France, for fine Specimen of Dyed Wools and Paste Colours for Paper Stainers.

Campbell, Ira, New York, U. S., for Self-Adjusting Cottage Side Board.

Cooper and **Belcher**, Camptown, U. S., for Machine Engraved in Union with Etched Ornamental Window Glass.

Christofoli, Antonio, Padua, Italy, for Fine Mosaic Scagioli.

Ciando, Giuseppe, Nice, Sardinia, for Artistic Mosaic Wood Picture.

Collonello, Fco., Genoa, Sardinia, for Mosaic Tables.

Castelle, P., Paris, France, for Ingenious Applications of Fine Coloured Gelatine.

Copeland, W. T., London, Great Britain, for Decorative Porcelain Slabs.

Dornback, Ferdinand, New York, U. S., for Margueterie Inlaid Flooring.

Du Boix, J. G., New York City, U. S., for Varnished Maple and Pine Door.

De Zureck, J. B., Troy, U. S., for Gothic Carving.

Daniel, Charles B., Bethlehem, U. S., for Blue Mountain Slate for Roofing.

Demeure, Mauritz, and Co., New York City, U. S., for Design and Castings of French Iron Bedstead.

Derndinger, J. A., **Sohler** and Co., Offenburg, Baden, for Artistic Etched Enamelled Glass.

Descalzi-Campanino and **Son**, Genoa, Italy, for Imitation Turtle-shell Furniture.

Eshwind, John, New York City, U. S., for Mechanical Action in Furniture.

Feilhammer, F. A., Brünn, Austria, for Ornamental Gold Lettering on Glass.

Fialeix, Mayet, Seine Inferieure, France, for Stained Glass Picture.

Fleischmann, C. W., Nuremberg, Zollverein, for Papier Maché Composition Casting.

Franzi, Giuseppe, Milan, Lombardy, for Carved Stone Furniture.

Fontana, Pietro, Carrara, Italy, for Fine Marble Vases.

Falcini, Bros., Florence, Italy, for Rich Inlaid Antique Furniture.

Farley, H. T., New York, U. S., for Works in Scagliola.

Ferris and **Taber**, New York City, U. S., for Sculptured Marble Chimney Pieces.

Freund and **Miller**, New York City, U. S., for Ligneous Marble.

Feron, J. F., Paris, France, for Twisted and Inlaid Stair Rail.

Franceschini, Francesco, Pisa, Italy, for Rustic Furniture.

Fletcher, John, Cork, Ireland, for National Shamrock Table.

Fleitman, Herman, Cologne, Prussia, for Hand Modelled Flower Springs and Machine Gilt Mouldings.

Golder, A., and **Son**, Baltimore, U. S., for Fine Variety of Paper Hangings.

Gillies, T. S., New York City, U. S., for Centripetal Spring Chairs.

Gori, Ottaviano, New York City, U. S., for Plain Variegated Marble Chimney.

Guyot, Paris, France, for Buhl and Ebony Wine Cellarets.

Graves, Robert, Brooklyn, U. S., for Good Oak Paper Hangings.

Goodridge, T. W., New York City, U. S., for Works of Utility in Soapstone.

Garassino, T., Savona, Italy, for Fine Mosaic Wood Pictures.

Gartwaith, Robert, New York City, U. S., form Imitations of Woods and Marbles.

Goggan, Cornelius, Dublin, Ireland, for fine Artistic Carving in Bog Wood.

Garassino, T., Savona, Italy, for fine Carved Frame.

Gamelkoorn, R. J., Arnheim, Holland, for Carving in Ebony.

Hydeville Slate Company, Vermont, U. S., for fine quality of Roofing Slates.

Heinz, Gotthold, Johanngeorgenstadt, Saxony, for Inlaid Pearl Furniture.

Hutchings, E. W., New York City, U. S., for Carved and Gilded Furniture.

Hunter, A., Demerara, for Mosaic Table of 133 Native Woods.

Howlett, William, London, Great Britain, for fine Specimens of Block Cutting and Paper Hangings.

Henderson and Co., Durham, England, for fine Specimens of Wilton, Brussels and Venetian Carpeting.

Hills, Anna M., St. Louis, Missouri, for Rich Embroidered Chair.

Harmington, W. J., New York City, U. S., for good Ornamental Panel Lights and Borderings of Stained Glass.

Hallifax, N., Buffalo, U. S., for Design and Carving of Melodeon Case.

Hart, Ware and Co. Philadelphia, U.S., for well Finished Japan Furniture.

Herter, Gustav, New York City, U. S. for fine Carving on Oak Buffet.

Hyde, J. L., New York City, U. S., for Specimens of Inlaid Japanned Ware.

Holland, William, Warwick, Great Britain, for Glass Marble Table Top.

Houldsworth, J. and Co., Manchester, Great Britain, for the Upholstery, Design, &c. exhibiting their fine goods.

Hale, Frederick, and Co., New York City, U. S., for brilliant Gold Lettering on Glass.

Huetter and **Osterhausen**, Nuremberg, Zollverein, for good samples of Cheap Framed and Silvered Looking Glasses.

Jewet, John and **Son**, New York City, for good quality Printed Floor Cloths.

Jegel and **Schwartz**, Solenhofen, Bavaria, for Mosaic Flooring, from their lithographic stone quarries.

Jones, Arthur and Co., Dublin, Ireland, for Carved Devonport Writing Table, of Irish Bog Yew.

James, Henry William, Camden Town, London, Great Britain, Machine Ornamented and Enamelled Window Glass.

Irvine, Colonel, Canada Quebec, for a Maple Table Top, decorated with the natural leaves.

Kimbal and **Staples**, Illinois, U. S., for fine Specimens of American Veneers.

Kugler, J. N., Güns, Hungary, for Modelling in Terra Cotta.

Kerby, J. H., New York, U. S., for Hand-painted Marble Paper Hangings.

Kelty and **Ferguson**, New York City, U. S., for Painted Window Shades.

Kingsland, Richard and Co., New York City, U. S., for fine design and execution of large Composition Gold Frame.

Lecun and Co., Paris, France, for fine Specimens of Carpet Rugs and Footmats.

Laning, W. M., Baltimore, U. S., for good Script Sign Writing.

Lange, G., Erben, Oberammergau, Bavaria, Germany, for fine Carving in Wood.

Lahoche, P. J., Paris, France, for superb Ormolu and Decorated Porcelain Toilet Tables.

Lanfeltd, G. A., Berlin, Prussia, for fine Gilt Mouldings and Composition Ornaments.

LATILLA, EUGENIA, New York, U. S., for Encaustic Painting.

LUTZ, IGNATIUS, Philadelphia, U. S., for stained Furniture.

LOWELL COMPANY, Lowell, Massachusetts, U. S., fine varieties of 3 ply Power-loom Carpeting.

LONDON and PENZANCE SERPENTINE MARBLE COMPANY, for Norman-Gothic Baptismal Font.

MOURCEAU, J. C., Paris, France, for fine samples of rich Furniture Covering.

MORGAT, Paris, France, for rich Specimens of Tapestry for Furniture Coverings.

MAYER, T. J. and J., Longport, Great Britain, for Porcelain Table Tops and Decorated Slabs.

MORANT and BOYD, London, Great Britain, for the design and execution of Carved and Gilded Console Table Mirror Frame.

MORANT and BOYD, London, Great Britain, for fine Inlaid Coloured Wood Flowers on Cabinet Tables, &c.

MESS, L. and Co., Brandenburg, Prussia, for fine variety of Gilt Frame Moulding.

METZ, A., Luxemburg, Belgium, for combination of Wood and Iron in Furniture.

MOSAIC SLATE COMPANY (by J. T. Smith, New York), New York City, U. S., for fine Specimens of Coloured Slate.

MICHEL, E. L., New Orleans, U. S., for Embroidered Chair.

MORGAN, JAMES, Quebec, Canada, for Design and Cutting Stone Front.

MINTON, HERBERT and Co., Stoke-upon-Trent, Great Britain, for Mural decorations.

MERCHER, JAMES, New York City, U. S., for good Styes and preparation of Frame Mouldings.

MORANT and BOYD, London, Great Britain, for fine Imitation Florentine Mosaic Table Tops and Panels.

MORANT and BOYD, London, Great Britain, for Imitation Bronze Furniture.

MORGANT, E., Guines, France, for fine Transparent Painting.

MAES, J., Clichy, France, for Ornamental Glass mountings for Doors.

MARTIN, OVIDE, Paris, France, for Iron Castings for Furniture and Decorations.

NORTH RIVER MINING COMPANY, U. S., for Worked Specimens of American Marble.

NOVARO, L., Genoa, Italy, for elegant light Chairs in Gold.

O'NEIL, Newark, New Jersey, U. S., for Mechanical Arm Chair.

ONEIDA COMMUNITY, New York, U. S., for Rustic Garden Furniture.

PHILADELPHIA SCHOOL OF DESIGN, U. S., Misses J. Speakman, S. Raymond, M. Knight and C. Cowen, pupils, fot Inventive Taste displayed in their Specimens.

PERKINS and SMITH, New Bedford, U. S., for variety of good Paper Hanging.

PACCHIANI, F., Florence, Italy for Sculptured Marble Chimney Piece.

PRIORS, WIDOW L. J., Arnheim, Netherlands, for the Manufacture of Carpets from Cow Hair.

QUAST, F., Leipsic, Saxony, for Fine Printed Oil Cloths.

ROYAL IRON FOUNDRY, Berlin, Prussia, for Design and Casting of Baptismal Font.

RINGUET, LE PRINCE and MARCOTTE, Paris and New York City, U. S., for beauty of Carving on Oak Sideboard.

ROHLIK, L., Prague, Bohemia, for a fine Artificial Marble Composition.

RAMSAUER, JOHANN G., Hallstadt, Austria, for fine Specimens of Variegated Marble.

RAU and Co., Göppingen, Wurtemberg, Zollverein, for Japan Furniture.

ROXBURY MIRROR MARBLE COMPANY, Massachusetts, U.S., for Glass Marble Mantels.

RINGUET, LE PRINCE and Co., Paris, France, for fine Buhl Work.

SALM, PRINCE VON, Vienna, Austria, for Design and Casting of Candelabra.

STEPHENSON, MATILDA C., Brooklyn, U. S., for Specimens in the Early Style Stained Glass.

———, British Guiana, for Characteristic Frames, with 13 Native Woods of British Guiana.

SCHUTZ, L. W., Utrecht, Holland, for Articles of Decorative Utility in Zinc.

SCHREDER, E. J. and Co., New York City, U. S., for Ornamented Window Shades.

SOLMS, COUNT, Baruth (Glass Works), Prussia, for a good quantity of Coloured Glass.

SALAMANDER MARBLE COMPANY, New York City, U. S., for Imitation Marbles on Iron.

SUTCLIFFE, ISHERWOOD, Birmingham, Great Britain, for General Excellence in Papier Maché and Japan Ware.

SHOOLBRED, LOVERIDGE and SHOOLBRED, Wolverhampton, Great Britain, for fine Japan Ware.

SHATTUCK, DANIEL W. G., Boston, U.S., for School Desks.

SOLOMON and HART, New York City, U. S., for Upholstery Design and Ornament, to display their goods.

THOMPSON, DAVID, Dundee, Scotland, for good styles and qualities of Carpeting and Rugs.

TROY CARPET MILLS, Troy, U. S., for good Specimens of Cut Velvet Tapestry Carpeting.

TREBBI, O., Rome, Italy, for polished Oriental Granite Column and Sculptured Caps.

TORSEGNO, G., Genoa, Italy, for two rich Wood Carved, Gilded and Coper-lined Vases, in low relief.

TAYLOR and PORTER, Pennsylvania, United States, for large specimens of Framed Slates.

THOMAS BROS., New York City, United States, for Cartoon Pier Decorations.

TRONCHON, Paris, France, for Iron Furniture.

VOLKERT, CHRISTOPHER, New York City, United States, for Inlaid Flower Panels in Stained Wood.

VALLANCE, JOHN, Matlock, Great Britain, for rich Inlaid Marble and Spar Tables.

VANDENBERG, J., Leyden, Holland, for Cloth and Gold Paper Hangings.

VIEILLE MONTAGNE ZINC COMPANY, France, for articles of Decorative Utility.

VOSS, EMELIE DE, Apenrade, Schleswig, Germany, for a clever Handwrought Carpet, of great merit.

VALLET and Co., Forback, for Coloured Glass of many tints.

VOGELIN and Co., Constance, Switzerland, for Velvet Paper Hangings.

WINSLOW, S., New York City, United States, for carved specimen of Caen Stone.

WILLARD, SAMUEL, Troy, United States, for a portable Tent and Bed Frame.

WRIGHT, MISS GERTRUDE, Derry, Ireland, for Wood Carving.

WEGLIN, D., Berne, Switzerland, for Carved Tables.

WALKER, D., and Co., Newark, United States, for Self-rocking Cradle.

WINTER and Co., Newark, United States, for Works in Terra Cotta.

WINTERBOTTOM, ARCHIBALD, Manchester, Great Britain, for Variety of Cloth and Metal Ground Paper Hangings.

WALLER and KREPS, New York, for Design and Execution of Large Mirror Frame.

ZORA, G., Turin, Italy, for a Rich Greek Chair carved, &c. in Gold.

ZAMPINI LUIGI, Florence, Italy, for Japan Furniture.

ZOLLEZZI, STEFANO, and **SON**, Italy, for polished Slate Tables and Tiles.

KUGLER, J. G., Inventor, Nurnberg.
SCHELHORN, S., Designer, do.
THIEME, E., Modeller, do.
KLETT and Co., Executors, do.

For Design and Execution of the Iron Case containing Contributions from Nuremberg.

JURY I a.

Part of Class 19 and Class 20.—Lace, Sewed and Tamboured Muslins, Embroidery, Fringes, Fancy, and Industrial Works.

JOHN BECK, Esq., Chairman.
SAML. R. DOWNER, Esq.
A. KUNZLER. Esq.
THOS. LOWNDES, Esq.

Bronze Medal.

Anderson, Miss Ellen, Louisville, Kentucky, Patchwork Quilt; "Henry Clay."

Adams, Miss Jane, Strabane, Ireland, Lace Scarf of unbleached Linen Thread.

Ames, Broadbent, and Co., Manchester, England, Mohair, Alpaca, and other Braids.

Bulpin, George, New York, Embroidered Cloaks and Mantillas.

Brodie, Geo., New York, Embroidered Cloaks and Mantillas.

Bell, Molyneux, New York, two Embroidered Velvet Cloaks.

Bennett and Co., Frank, New York, a Velvet Cloak and embroidered Silk Mantles.

Birdsall, Haskell, and Co., New York, Embroidered Bridal Basket,—Infant's Clothing.

Barnett and Son, L. C., Nottingham, England, Wrought Silk Laces.

Belshaw, Maria Louisa, Bedford Avenue, Brooklyn, Embroidery on Worsted and Silk.

Begg, Mrs., 82 years old, Scotland, pair worsted knitted Hose.

Boehler and Son, F. L., Plauen, Saxony, Embroidered Handkerchiefs.

Berger, Madame, Brussels, Nymph Corsets.

Bertrand, Freres, and Henri, Paris, Emboidered Handkerchiefs.

Bouchard, J. B., Madame, St. Valliere, Canada, Counterpane and knitted Linen Counterpane.

Coleman, Mary Ann, Mrs., Frankfort, Kentucky, three Patchwork Quilts, with special commendation.

Clarke, Mrs., G. P., Detroit, Michigan, Gold and Worsted Embroidery; subject, "King David playing on a Golden Harp."

Cripps, Mrs. Mary C., New York, a case of Bonnets, with special commendation for elegance of form and neat workmanship.

Cleary, Miss Margaret, Clonmel, Ireland, Berlin Wool Embroidery.

Contour, Frederic, Paris, various articles of wearing apparel.

Compere, E., Paris, Gloves.

Drummond, M. J., New York, Gold Embroidered Regalias, with special commendation.

Dey, Lavinia, Worsted Embroidery—"the Lord's Supper."

Disbrow, Miss Harriet (eight years old), Crotchet Table Cover.

Demarest, Mrs. M. W., New York, Demonstrative Scale for dress fitting, with special commendation.

Ditl, Madame, London, Embroidered Screen.

D'Ambly and Co., Stuttgart, Corsets without seams.

Defrenne, Sophie, Brussels, Brussels Lace Fabrics, with special commendation.

Ducly, Madame, Paris, Embroidered Silk Robes.

Dutton, Miss Eliza. Montreal, Knitted Cradle Quilt.

Dubois, Mrs. M. D., Silk Velvet Bed Quilt, composed of 5,312 pieces.

Eibenstuck and Co., Annaberg, Saxony, Gimp, Trimmings.

Everaert, Julie, Brussels, Brussels Lace Fabrics.

Forrest and Sons, James, Dublin, guipure and applique Limerick Lace.

Förster, F., Eibenstock, Saxony, Laces.

Ficker, J., Bernhard, Annaberg, Saxony, Crotchet Table Covers.

Fabian, J. G., Bautzen, Saxony, Woollen Hosiery.

Genin, John N., New York, Children's Embroidered Clothes, with special commendation.

Gardner, O. W., Boston, Woollen Hosiery.

Gittens, Mrs. Rebecca, Philadelphia, Patent Demonstrative Scale for cutting Ladies' Dresses, with special commendation.

Genin, John N., New York, fine split Straw Hats.

Guillemot, Brothers, Paris, Coach and Livery Laces.

Gantillon, C. E., Lyons, specimens of Black Lace Articles.

Globensky, Miss, Lachine, Canada, complete set of Embroidery for Furniture.

Geddes, Rev. J. G., Hamilton, Canada, Berlin Wool Carpet.

Hogeboom, Helen, Castletown, New York, Embroidered Broadcloth Table Cover.

Herbst, Mary L. G., New York, Fine Embroidery in Gold and Silver, with special commendation.

Hesser, Madame, V. G. L., Knitted Bed Quilt, with special commendation.

Hardorp, Mrs. W., Silk Embrodery "Washington," and "The Virgin Mary."

Higgins and Co., John, Dublin, Lace Berthe and Collar.

Hall, J. and J., Thread and Silk Hosiery.

Helweg, Hans, Buchholz, Saxony, White Sewing and Ball Fringes.

Hietel, Albert, Leipsic, Saxony, Worsted Embroidery, with special commendation.

Johnston, Brothers, and Townsend, Manchester, England, specimens of Children's Cotton Hose and Gloves.

Jourdan and Co., Paris, specimens of Black Lace Articles.

Jouvin and Co., Veuve X., Paris, specimens of superfine Gloves.

Jobin, Madame J. B., Quebec, Knitted Woollen Over Socks.

Ketcham, Miss M. C., New York, Bed Quilt, ornamented with Worked Flowers.

Lossin, Martha, Alabama, Embroidered Centre-table Cover.

Lambert and Bury, Limerick, specimens of Limerick Laces.

Lautner, Lewis, Scheibenberg, Saxony, Curtain Fringes.

Lefebure, Aug., Paris, specimens of rich Thread Lace Articles.

Lutter, T. J., St. Gall, Switzerland, Embroidered Curtains.

Morgan, A. and F., New York, Embroidered Bed Quilt.

Miles and Carlock, Bridgeport, Connecticut, specimens of Coach Laces, Tassels, and Carriage Trimmings.

Maracaibo, Native of, Venezuela, Two Embroidered Handkerchiefs.

McNebbie, Annie, Worsted Embroidery—subject, "Esther before Ahasuerus."

Munroe and Co., Alfred, New York, Boys' Embroidered Clothes.

Mauny, Madame J., New York, Ladies' Corsets.

McDonald and Co., D. and J., Glasgow, Great Britain, Toilet Cover.

Manley, Mrs., Blackrock, Cork, Ireland, specimens of Guipure Lace.

Morgat, Paris, samples of Embroidered Tapestry.

Milon, Ainé, Paris, Silk Hosiery.

Martel, Mlle. P., St. Ambroise, Canada, Lace Caps and Collars.

McGrath, James, Quebec, Berlin Wool Carpet.

Newstadt, Emily, New York, Silk Embroidery, "Washington on Horseback."

Nathan, Beer, Trefousse and May, Paris, Ladies' and Men's Kid and Silk Gloves.

Purdy, Mary W., New York, White Cambric Quilt, Embroidered.

Paulsen, Charlotte, Hamburg, Worsted Embroidered Cushion.

Prochaska, W., Prague, Bohemia, Two Mosaic and Embroidered Table Covers.

Roberts, Peter, New York, Infant's Lace Robe and Cap.

Rogers and Co., P. L., New York, Children's Embroidered Clothing, with special commendation.

Rouquette, Paris, Kid Gloves.

Rolph, Jonas, Nottingham, England, Imitation Brussels Point Lace.

Reid, Mrs. John, Knitted Quilt.

Slote, Oriana, New York, Silk and Worsted Embroidery, "The Last Supper," with special commendation.

Scott, Isidor, 11 years of age, Worsted and Bead Embroidered Cap and Slippers.

Sedgwick Theodore, very small and fine specimens of Worsted Knitting.

Summers, Mrs. S. F., Worsted Embroidery specimen, "A Buffalo."

Sallenbach, Mrs. Barbara, New York, Case of Corsets.

Simmons, William, New York, Case of Bonnets, with special commendation for fineness and even finish.

Stuart, Mrs. H., New York, Case of Dress Caps.

Saxton, Alfred, Nottingham, England, Cotton Laces.

Sisters of Mercy, Kinsale, County Cork, Ireland, Vestments, Embroidery, Flowers, Lace, &c.

Scharff, Robert, Brieg, Silesia, Silk and Worsted Borders, Tassels, and Gimps for Carriages.

Stecher and Co., Carlsruhe, Baden, Corsets without seams.

Suchel-Damas, Thiry, Rhone, Fine Corsets without seams.

Schlæpfer, Schlatter and Co., St. Gall, Switzerland, Embroidered Curtains.

Staheli-Wild, Casper, St. Gall, Switzerland, richly Embroidered Table-cover, with special commendation for the beauty of the design.

Tilt and Dexter, New York, Silk Fringe and Tassels.

Taylor, S. T., New York, Original plan and patterns for cutting Ladies' Dresses.

Twiss, John, Germantown, Fancy Woollen Hosiery.

Tailbouis, E., Paris, Silk Thread and Woollen Gloves.

Tessada, Francesco, Genoa, Embroidered Handkerchiefs, with special commendation for the design and work.

Thompson, Miss Kate, Toronto, rose-point Lace Collar.

Tetu, J., Berthier, Canada, Woollen Night-caps.

Thompson, Mrs., Quebec, Baby's Knitted Dress, in crotchet work.

Vogle, George, New York, specimens of Gold Embroidery.

Voorhes, Mrs., Lace Collar and Muslin Embroidery.

Wason, Mrs. M., Somerville, Massachusetts,. two pieces, Worsted Embroidery.

Wakefield Manufacturing Company, Germantown Pennsylvania, specimens fancy Hosiery, Silk Shirts and Drawers.

Wilcox, John, New York, Worsted Embroidery Convention of Artists in the Vatican.

Williams, Mrs. Jas., Dublin, Berlin Wool Picture of "Her Majesty."

Wolter, F. E., Stollberg, Cotton Hosiery,

Werly and Co., Robert, Bas-le-duc, France, fine corsets without seams.

Ward, Mrs. Anna, View Giant's Causeway in Needlework, special commendation.

Zimmermann and Son, Christian, Apolda, Saxe-Weimar, Woollen Hosiery.

Honourable Mention.

Aube, Madame, Canada, specimens Woollen Stockings.

Behr, G. F., Chemnitz, Saxony, variety of Silk Gloves.

Bourry, D'Ivernois and Co., St. Gall, Switzerland, Embroidered Lace Curtains and fine Muslins.

Couture, Madame, St. Ambroise, Knitted Woollen Stockings.

Geuch, Madame, Canada, Woollen Hosiery.

Hollander, Mrs. Maria T., Boston, Children's Clothing.

Holden and Co., John, Belfast, Embroidered Caps and Froc kBodies.

Industrial Poor School, Cork, Crotchet Work.

Kohreutter, Felix, St. Gall, Switzerland, Embroidered Handkerchiefs.

King, Carl, New York, Straw Kat in case 88.

Isaacs, Mrs. Lyon, white Embroidered Opera Bonnet white Blonde Bonnet.

Lutter, T. G., Switzerland, Embroidered Handkerchiefs.

Macdonald and Co., D. and J., Glasgow, case of Embroidery.

Mezetti, Miss, New York, Worsted Work.

McBride, Mary A., New York, Embroidery—"Laban, Rebecca and Jacob."

Roele, F., Graslitz, Bohemia, Handkerchiefs.

Wilson, Peter, New York, specimens Indian Embroidery.

Sub-Jury Ia.—Ladies Garments, Cloaks, Shirts, &c.

Jurors.

ANN S. STEPHENS.
E. S. SHAILER.
MARTHA E. WINTERBOTHEM.

Gentlemen,—We have examined those Departments of the Crystal Palace assigned to our Committee for inspection repeatedly, and with the greatest desire to form an impartial judgment.

In the United States Department we have made no awards for articles not proven to our entire satisfaction as worthy, and made, not only in this country, but in most cases at the manufactories of the persons exhibiting. This proof we have obtained in person wherever a doubt arose.

If some degree of liberality has been exercised in awarding the highest prizes in this and some other departments upon which female talent and labour has been expended, it is from an honest, and, we believe, proper desire to encourage those enterprizes that give dignity and value to female labour, and because the average of merit is so great that we could not justly pass by so many beautiful specimens of art, honourable alike to our own sex and country, with stinted praise.

With a strong desire for the encouragement of our own sex in those pursuits proper to the feminine character, we respectfully recommend that the "Shirt Sewers' Union," in addition to any awards that may be made by this or other Committees, receive a silver medal, as a mark of special honour and expression of warm sympathy in their struggles for success.

Silver Medal.

Shirt Sewers' Union, as a mark of special honour and expression of warm sympathy in their struggles for success.

Van Skellin, F. 389, Broadway, New York City, for the invention of various Dyes exhibited in Artificial Flowers, by which materials the leaves and petals receive tints of the natural flowers they represent.

Bronze Medal.

Brunetti, Miss Maria, Waterford, Ireland, Landscapes in Cut Paper.

Civatte, Madame, 64, White-street, New York, for Head Dresses of Artificial Flowers, and an Artificial Rose Clock, with "special approbation;" for the Basket of Artificial Flowers, with "particular mention" for some beautiful Lilacs which the Basket contains.

Day, Miss, Dublin, Ireland, for Baskets and Bouquets of Irish Seaweed.

Green, George T., 1 Astor House, New York, for an elaborately Embroidered Shirt, with "special approbation" for the great beauty of the Embroidery.

Guillaime and Korn, 101 William Street, New York, for a Case of Artificial Flowers.

Gray, Mrs., 11 Clinton-street, Brooklyn, for a Case of Shell Flowers. with "special approbation" for the extraordinary and delicate beauty of the Orange Blossoms in the Basket.

Hayes, Graig and Co., Louisville, Kentucky, for Children's Hats.

Hickock, Mrs. Westley, for a Case of Wax Fruit and Flowers.

Long, George, Longwater, High-Wycombe, England, for a Case of Lace Straw Hats.

Leighton, Charles, 16 Park Place, New York, for a Plaited Bosom.

Nicoll, George, Genin's Bazaar, New York, Ladies' Boots and Shoes, with "special approbation" for workmanship.

Palmer and Farr, Mesdames, 459 Broadway, New York, for a Dressing Gown of Chinese Silk, with "special approbation" for the Sewing on Shirts.

Read, Mrs. Sarah Ann, 8 Leroy Street, New York, for a Wreath of Pearl Flowers, with "special approbation" for Wax Fruit and Flowers.

Remy, St., 38 Lispenard-street, New York, for Feathers in "Genin's Case," with "special commendation" for the graceful sweep of his feathers, and the beautiful delicacy with which his ostrich plumes are tipped with marabouts.

The Shirt Sewers' Union, New York, for a Case of Shirts, with "special approbation for Fine Sewing."

The Children of the School of the Ursuline Convent, Kinsale, Ireland, for Feather Flowers.

Van Skelline, F., 389 Broadway, New York, for a Wreath of Artificial Flowers and Fruit, with leather surrounding case.

Van Houten, Mrs., 82 Nassau Street, New York, for a Plaited Shirt Bosom, with "special approbation" for the frilled bosom.

Van Skelline, Mrs. F., 389 Broadway, for Artificial Flowers, in pots, and for the perfect imitation of a tuft of dandelion running to seed.

Honourable Mention.

Civatte, Madame, 64 White-street, New York, for the ingenuity of design of Artificial Rose Clock.

Hickock, Mrs. Westley, for a Centre Flower, in a Case of Wax, Fruit and Flowers.

Leighton, Charles, 16 Park-place, New York, for Fine Sewing on a Shirt Bosom.

Jury J.

Classes 21 and 22.—Cutlery and Edge Tools. Iron, Brass, Pewter, and General Hardware, including Lamps, Chandeliers, and Kitchen Furniture.

Jurors.

MATTHIAS STRATTON, Esq., Philadelphia, Chairman.
JOSEPH C. DILKS, Esq., 82, Catherine Street, Secretary.
ROBERT S. LUQUER, Esq., 122, Pearl Street.
CHAS. TOLLNER, Esq., 221, Broadway.
Prof. E. N. HORSFORD, Esq., Cambridge, Mass.
J. D. CHEVALIER, Esq., 360, Broadway.
A. STRATTON, Esq., 91, Fulton Street, Brooklyn.
D. C. HALSTED, Esq., 119, Maiden Lane.
D. S. ARNOLD, Esq., 19, Courtland Street.
SAMUEL COULTER, Esq., 221, Pearl Street.
H. A. HURXTHAL, Esq., Mobile.
T. E. RADCLIFF, Esq., 23, Courtland Street.
ALBERT S. LEE, Esq., 87, Maiden Lane.
LEONARD M. RUST, Esq.

Silver Medal.

Cornelius, Baker and Co., Philadelphia, for the great variety and best display of Gas Chandeliers, &c.

Day and Newell, 589 Broadway, New York, for the originality, safety and durability of the Parautoptic Bank Lock.

Japy, Brothers and Laiauce, Beaucourt, Mance, France, for the superior quality and beauty of finish of their enamelled and tinned Wrought Iron Ware, and new and peculiar process in manufacturing.

Meneeley, A. and Sons, West Troy, New York, for a Peal of Bells, also Factory and Steamboat Bells.

New England Screw Company, Providence, Rhode Island, for improvement in manufacturing Gimlet and Pattern Screws, superiority of finish, and excellence of workmanship.

Sherwood and Fitzgerald, Gold-street, New York, for unqualified excellence of the "Invulnerable Reservoir Safe" as proof against fire, with more than ordinary token of special approbation.

Simcox, Pemberton and Sons, Birmingham, England, A. Fielder, Platt-street, New York, Agent, for the best display and great variety of brass Cabinet Goods, comprising Curtain Bands, Hinges, Bell Pulls, Door Springs, &c.

The Collins Company, Hartford, Connecticut, for general excellence and superiority of finish in the manufacture of Axes, Adzes, Cleavers, and other heavy edge tools.

The Steele and Johnson Manufacturing Company, Waterbury, Connecticut, for the great variety and best display of Metal Buttons.

The Society of La Vieille Montagne, Rue Richer, Paris, for the various Fancy Groups and Articles in Zinc, Zinc Statuettes, &c.

Bronze Medal, with Special Approbation.

Garside, John, Newark, New Jersey, for general excellence in the manufacture of Table Cutlery.

Marsh, Brothers & Co., Pond Works, Sheffield, England, for general excellence and superiority of finish in their extensive assortment of Cutlery, Saws, Edge Tools, &c. &c.

Bronze Medal.

Baker, William, Allen-street, London, for a very fine exhibition of superior finished Awls, Bodkins, Brads, &c. of various kinds.

Barnes, Charles L., New York City, for a new Expansion Bitt for boring wood, requiring but three bitts to bore from quarter inch to two inches, and to bore any size intermediate by expansion of the outer cutter of the bitt.

Bleckmann, John E., Ronsdorf, Renish Prussia, for superiority of finish in the manufacture of general Hardware.

Clark, Thomas and Charles and Co., Wolverhampton, England, for the well known superiority of their Cast Iron Hollow Ware.

Connerse, Charles A. and Co., Norwich, Connecticut, for superiority of finish in the manufacture of Screw Augers and Auger Bitts.

Cresson, William P. and Co., Philadelphia, for various tinned and enamelled Cullinary and Household Articles.

Cunningham and Daggett, Cincinnati, Ohio, for superiority of finish in Drawing-knives and Coopers' Tools generally.

Dittmar, Brothers, Heilbronn, Wurtemberg, for superior patent Razor and Razors Strops.

Eagle Works, West Winsted, Connecticut, for superiority of finish in the manufacture of Table Cutlery.

Elliot, Joseph, Hollis Croft, Sheffield, England, for general excellence in the manufacture of Razors.

Henckels, J. A., Berlin and Solingen, Prussia, for fine Specimens of Cutlery, manufactured from the refined steel of the Liegen Smelting Works.

Hodgetts, Taylor and Hodgetts, New York City, for the finest Specimen of Planished Ware and Water Coolers.

Hooper, Thacher and Co., Broadway, New York City, for the Iron Railing around the Statuary of Thorwaldsen, in the Crystal Palace.

Houston, Daniel, New York City, for an improved and highly finished Cooper's Crose.

Hotchkiss and Sons, Sharon, Connecticut, for a patent Coach Wrench and patent Bow Pin.

Jones and Hitchcock, Troy, New York, for a Chime of Bells.

Johnson, Job, Brooklyn, New York, for superiority of finish in a variety of Patent Fish Hooks.

Karcher and Westermann, Metz, for great variety of Household Articles in Zinc and Tin.

Leonard and Wendt, New York City, for superiority of finish in patent Improved Shears and Bank Shears.

Low Moor Iron Company, Yorkshire, England—Agent, W. B. Lang, 24 Broadway, New York—for Specimens of Iron in all its stages of manufacture.

Mackrell and Richardson, Houston-street, New York for samples of Locks—for workmanship.

Milward, Henry and Son, Washford Mills, Redditch, England, for general excellence in the manufacture of Gold-eyed Grooveless Needles.

Morris, Tasken and Morris, England, for superior Lap-welded Steam and Gas Pipes.

New York Knife Company, Matteawan, Duchess County, New York, for superiority of Finish in the manufacture of Pocket Knives, and in the Finish of Pistol Knives.

Nock, Joseph, Philadelphia, for patent Seif-acting Locks and Bolts—for simplicity combined with safety.

Ohio Tool Company, Columbus, Ohio, for great superiority in the Finish of an Improved Screw Arm Plough-plane, richly mounted in Ivory, and for the superiority of Finish of all their Planes exhibited.

Pauley and Co., for a Prison Door.

Remington, Anne, Miss, 138 Sloane Street, Chelsea, London, for ingenuity of device and utility of patent Roasting Apparatus and Self-acting Baster and Heat-reflector.

Rodgers, Joseph and Sons, Sheffield, England, for superiority of Finish in an elaborately finished Sportsman's Knife, of large size, with Blades embossed variously, and Handle of richly carved mother-of-pearl.

Rosenlacher, Carl, Constance, Baden, for a Peal of Bells.

Ross and Wilcox, Mattabesset Works, East Berlin, Connecticut, for general excellence in the manufacture of Machines and Tools for Tin-workers.

Roswag, A. and Son, Schlestadt, Haut-Rhin, for skill in manufacturing fine Gauze Metallics and Cloth.

Royal Iron Foundry, Berlin, for general display of Fancy Iron Castings, Warwick Vase, &c.

Shoolbred, Loveridge and Shoolbred, Merridale Works, Wolverhampton, England—Agent, James N. Lawton, New York and Boston—for large display and excellent quality of Japanned Tea Trays, Waiters, Household Articles and Kitchen Ware.

Smith, William and Co., Birmingham, England, for very superior Wire for Pianofortes.

Tronchon, ———, Paris, France, Iron Furniture and Garden Ornaments.

Turton, Thomas and Sons, Sheffield, England, for general excellence in the manufacture of Files and Rasps of all descriptions.

Union Knife Company, Naugatuck, Connecticut, for general excellence in the manufacture of Pocket Cutlery.

Walcott, Brothers, Boston, Massachusetts, for excellence in a new patent Graduating Button-hole Scissors.

Wickeersham, J., New York City, for Iron Railings around the galleries and stair-cases of the Chrystal Palace.

Windle and Co., Maiden Lane, New York, for superior quality of Plauished Tin Ware, and large display of various Housekeeping Articles.

Whitlock, John H., Troy, New York, for Cast and Turned White Britannia Metal Ware, for peculiar composition of metal, admitting high finish and silver white appearance.

Wright, William and Co., Newark, New Jersey, for highly finished Railway Carriage and Cart Springs.

Honourable Mention.

Atlantic Railway Works, New York, for Iron Railing around the equestrian statue of Washington, and Carew's statue of Webster.

Alviset, Amedee, New York City, for his exhibition of a large assortment of very finely finished Hunting Knives, Dirks, Scissors, and other fine Cutlery.

Arnold, Francis, Middle Haddam, Connecticut, for ingenuity of device of combined Lantern and Foot-stove.

Barratt, John B., Gold-street, New York, for excellence of finish of Brammah's Patent Lever Locks, of every description.

Bates, Griffin and McChesney, Troy, New York, for "Lillie's" Safe.

Benedict and Burnham, Dey-street, New York, for the best display of Rolled Brass and German Silver.

Blanchard, George J., Concord, New Hampshire, for patent clasp broom, with metallic adjusting clasp.

Böker, R. and H., Remscheid, Prussia, for a very fine exhibition of Hardware and Cutlery of many varieties, and for Cabinet Locks.

Bunger, Jacob, jun., Barmen, Prussia, agent E. Behr, New York City, for Hardware.

Burr, Waterman and Co., New York City, for a hot-hammered patent Circular Saw.

Beissel's, S. Widow and Son, Aix-la-Chapelle, for a variety of specimens of Needles made from English cast steel.

Caumes, M. F. Paris, for an Instrument to aid in Threading Needles.

Chance, Wm., Son and Co., Birmingham, England, for Iron Chains for ships and other purposes.

Chauffriat and Co., St. Etienne, France, for Anvils, Furnaces, &c.

Churchill, Willis, Hamden, Connecticut, for specimens of beautifully finished Screw Auger, Auger Bitts, and Hollow Augers.

Clampett and Regester, Baltimore, Maryland, for a large Church Bell.

Cabble, William, Elizabeth-street, New York, for Composition wire for fourdrinier machines.

Cole, George, H., New York City, for superiority of finish in a variety of tools for Cabinet and Pianoforte makers, and for Sculptors.

Cook, Edward, New York, for a case of highly finished Pins.

Cortlan and Co., Baltimore, Maryland, for improved Refrigerator.

Cox, Joseph and John, Broadway, New York, for general display of Gas Fixtures.

Dardonville, H., Broadway, New York, for a general display of Ships' Lamps, Brackets, &c., &c.

Dergoten, J. L., the Hague, Netherlands, for excellence of ornamental work of specimens of grates.

Douglas, Thomas, agent, New York City, for specimens of superior finished Nail, Riveting and Machinists Hammers, of D. Maydole and Co.'s manufacture.

Douglas, Thomas, New York, for fine steel squares.

Fitch, W. and E. T., New Haven, Connecticut, for excellence of finish of a general assortment of Cabinet Locks.

Fontaine, Came and Co., Frith-Saint-Léger, France, for variety of nails for boots and shoes.

Fournier, Valery, Dargnies, France, for excellence of workmanship of a case of Locks.

Gatchel and Gates, Newark, New Jersey, for Carriage Springs.

Grangoir, J. F., jun., Rue St. Appoline, Paris, for excellence of workmanship of various specimens of Locks of new style.

Griffin, J. K., Burford, Canada West, for ingenuity of device of the Kitchen Queen Cooking Stove.

Groves, Richard and Sons, Sheffield, England, for superior finished Saws and Files.

Guignier, T., Rue Grenelle, St. Honoré, Paris, for patent Water Closets.

Hammon's, G. C., Widow, Nuremberg, Bavaria, for variety of Fine Steel Articles.

Hardy, Thomas, Sheffield, England, for specimens of very beautifully finished Stilettoes, Crotchet Needles, Button Hooks, Nail Files, Corkscrews, &c., many of them mounted in pearl handles.

Hargreaves, Wm. and Co., Sheffield, England, for their exhibition of Table Knives and Carvers, mounted in ivory richly carved; beautifully finished Edge Tools, Razors, Pocket Knives, Scissors, &c.

Heinisch Rochus, Newark, New Jersey, for specimens of superior patent Shears, Bank Shears and Scissors.

Hill, Joseph, Birmingham, England, for a variety of stamped Brass Work for gas fixtures.

Hill, Brothers and Co., Walsall, England, for the style and quality of a case of Sadlery Hardware.

Keen and Hagerty, Maryland, for specimens of Toilet Ware.

Leroy, Thomas O. and Co., New York City, for specimens of Block Tin Pipe.

Levy, Hermann, Dresden, Saxony, for superior finished Carving Knives, and patent Shears.

Lewis Lock Company, Terryville, Conecticut, for excellence of workmanship of Cabinet Locks of all descriptions.

Marriott and Atkinson, Fitzalan Works, Sheffield, England, for superior Cut Files and Rasps.

McCullough and Co., Wilmington, Delaware, for American Galvanized Sheet Iron for Roofing.

Mackrell and Richardson, New York City, for Cast-iron Wired Butts.

New England Cutlery Company, Wallingford, Connecticut, for an exhibition of a very large assortment of beautifully finished Pocket Knives, one specimen containing over 300 blades.

New England Butt Company, Providence, Rhode Island, for Cast-iron Butt Hinges and highly finished Sad Irons.

Olcott, John N., Maiden-lane, New York, for the best specimens of Curtain Cornices.

Perkins, G. H., Portland, Maine, for the best Refrigerators.

Petit and Fritzen, Aarle Rintel, Netherlands, for Chime of Bells.

Piper, Hiram, Toronto, Canada, for improved Hip Bath.

Raymond, W. M. and Co., New York, Fisk's Patent Metallic Burial Case, for elegance of style and finish.

Reed, Franklin, Canton, Massachusetts, for various specimens of beautifully finished Tools for Shoemakers and Gardeners.

Rockwell, John W., Ridgefield, Connecticut, for Patent Save-all Candlestick.

Roger and Brothers, Philadelphia, for Seal Presses.

Ruffer and Co., Breslau, Prussia, for fine Zinc Plates.

Rimmer, John and Son, Alcester, Warwickshire, England, for superiority of finish in the manufacture of Needles, and for their fine exhibition of Sewing Needles of various kinds assorted.

Ruggles, Nourse, Mason and Co., Boston, Massachusetts, for their exhibition of superior finished Drawing Knives and Pocket Chisels of Weatherby's manufacture.

Russell, James and Sons, Staffordshire, England, for lap-welded Iron Tubes.

Schmidt and Moellenhoff, Aix-la-Chapelle, Prussia, for specimens of Iron and Steel Hardware.

Sellers, John, Sheffield, England, for a variety of specimens of Cutlery of various sorts.

Sheehan, C. H., and Son, Agents, New York City, for cheapness of production in finely finished Pocket Cutlery, Bowie Knives, and Razors of Sheffield manufacture.

Sirot, P., sen., Frith-Saint-Léger, France, for Fine Horse-shoe Nails, Copper, Brass, and Steel Brads.

Simmons, D., and Co., Cohoes, Albany County, New York, for superiority of finish in the manufacture of Axes and Hatchets.

Smith, S. W., and Brother, Maiden-lane, New York, for fine display of Housekeeping Articles.

Turner, T. and Co., Suffolk Works, Sheffield, England, for various specimens of very finely finished Cutlery.

Vandenbroucke, Paris, for Coffee Roasters.

Webb, William, New York, improved Candle Moulds.

Jury K.

Classes 28 and 29.—Manufactures from Animal and Vegetable Substances, not woven, fitted or otherwise specified; Miscellaneous Manufactures and Small Wares, Confectionery, Toys, Taxidermy, &c.

Jurors.

WILLIAM H. ELLET, M.D., New York, Chairman.
General AVEZZANA, Esq., 103, Pearl Street, New York.
W. H. CARY, Esq., 245, Pearl Street, New York.
A. D. EUSON, Esq., Hartford, Connecticut.
EDWARD LAMURCHE, Esq., 80, John Street, New York.
PHILIP SAUNDERS, Esq., New Haven, Connecticut.
HENRY WURTS, Esq., New York City.
EDWARD GLENN, Esq., Philadelphia.
JOHN GEBHARDT, Jun., Esq., Albany, New York.

Silver Medal.

Goodyear, Charles, New Haven, Connecticut, for specimens of India Rubber Fabrics.

The North American Gutta Percha Company, 80, Cedar-street, New York, for Gutta Percha Goods manufactured under Rider's Patent.

Bronze Medal.

With Special Approbation.

Bell, John G., 289, Broadway, New York, for specimens of Preserved Birds and Quadrupeds.

Carlo, Antonio Father, Genoa, Sardinia, for various specimens of Ivory Carving.

Ciaudo, Giuseppe, Nice, Sardinia, for a Picture in Wood Mosaic.

Hurst, James A., Albany, New York, for Preserved Game Birds of various Countries, Preserved Albino and Mottled Deer, Preserved Panthers Male and Female, Ourang Outang, Green Monkey, Fish, and other Animals.

Bronze Medal.

Allen, of Allensgrove, Wisconsin, for Waterproof Mail Bags.

Armstrong, S. D., proprietor, **H. L. Stuart**, exhibitor, New York, for specimens of Submarine Telegraph Wire with Gutta Percha Coating, Serial Tubing of Gutta Percha for carrying Water under Rivers, specimens of Submarine Wire now in use under the Straits of Dover and the Irish Channel.

Ainge and Aldred, London, for Fishing Rods and Tackle, Bows, Arrows, and Archery implements, richly carved.

Alexander, Paris, for specimens of richly ornamented Fans of Mother-of-Pearl.

Baker, W. and Co., manufacturers, (Agents, Hussey and Murray, South-street, New York,) for samples of Cocoa and assortment of Chocolates, &c.

Baumann, A., Brientz, Berne, for Glove Boxes, Vases of Flowers, Fancy Boxes, &c., richly carved in White Wood.

Brilla, A., Savona, Sardinia, for an Ivory Crucifix.

Benelli, G., Florence, Tuscany, for a Miniature Frame of Carved Boxwood.

Bate, T. and T. H., Maiden-lane, New York, for Needles, Fish Hooks, and all descriptions of Fishing Tackle.

Cerf and Naxara, Bordeaux, France, for elegant specimens of Pasteboard Work and Paper Boxes.

Claffen, Orren, Providence, Rhode Island, for Shell Combs of new patterns and designs.

Claraz, Ambrose, Switzerland, for Straw Bonnets, &c.

Conroy, J. and J. C., Fulton-street, New York, for assortment of Fishing Tackle.

Cochet-Verdy, Widow, Paris, for various descriptions of Masks.

Gaudet du Fresne, Paris, for Artificial Flowers and Foliage.

Lange, G. Erben, 123, Oberammergau, Bavaria, (Agents, Keller and Lingg, Pearl-street, New York, for various Articles Carved in Wood.

Fenn, John, Ann-street, New York City, for assortment of fine Ivory Combs; Combs in Turkey Box and Tortoise Shell; Tablets in Ivory, Pearl, and Tortoise Shell; Fancy Articles in Ivory, Rosewood, &c.

Fry, J. S., and Son, Bristol, England, for Soluble Cocoa, Native and Manufactured Chocolate.

Fountain, J. P., Broadway, New York, for the exquisite Ivory Crucifix made by the untutored Monk Fra Carlo Pesenti, of the Convent, St. Nicholas, Genoa.

Fletcher, John, Dublin, for Ornaments made of Bog Oak, Hair, &c.

Friedrich, J. H., Darmstadt, Hesse Darmstadt, for Ivory Drinking Cups and other carved articles.

Govaerts, Joseph, Pearl-street, New York, for an assortment of Prepared Chocolates.

Gerard, Tours, Indre et Loire, France, for Wicker Baskets and other Articles.

Geissman, J. and Co., Wohlen, Canton Argovie, for Straw Trimmings of all descriptions, Mixed Hair and Straw Trimming Braids, Laces, and various Fancy Articles; Straw Flowers, Embroideries in Straw upon Blondes.

Galliena, G., Turin, Sardinia, for a Bracket Sculptured in Wood, representing the Chase of the Wolf.

Garassino, V., Savona, Sardinia, for two Ivory Crucifixes.

Guillaume and Korn, William-street, New York, for specimens of Artificial Leaves and Flowers.

Goggin, Cornelius, Dublin, for Irish Bog Oak, Killarney Wood, Marble, and Horse-hair Ornaments.

Hollamby, Henry, Tunbridge Wells, Kent, England, for Tunbridge Ware Inlaid Chess Table, containing 200,000 pieces of natural coloured Woods, Writing Desk with 80,000 pieces, Workbox with 100,000 pieces, Inlaid Tea Caddy, Knitting Box, &c.

Hubner and Buholzer, Lucerne, Switzerland, for specimens of Horse-hair double and single Tress.

Hart, Samuel and Co., Philadelphia, for Mother of Pearl Card Cases, Work Boxes, Tablets, and various other articles.

Hannotin, Paris, for Porte Monnaies.

Houghton and Daniels, Hollister, Massachusetts, for Horn Dressing Combs.

Isler and Otto, Willdegg, Aarau, Canton Argovie, for a variety of rich Straw and Hair Braids, Trimmings and Embroideries upon Blonds, Laces, &c.

Kapp and Staudinger, Paris for Cellarets of Rosewood and Ebony, style of Louis XV.; various rich Papeteries in same style; Glove, Handkerchief, and Jewel Boxes of various styles, richly inlaid; Tea and Cigar Boxes, and Odor Boxes of various styles.

Kolle, Henry and Son, Southampton Mews, London, for Cocoa Nut Fibre, and Horsehair Fabrics.

Kehrli, Brothers, Giessbach, near Meyringen, Canton Berne, for Groups of Figures, Cottages, Cups, Bowls, and other objects carved in white and red wood.

Kehrli, Brothers, Brientz, Berne, for Table, Swiss Cottage, group of Chamois. and various other objects in carved Wood.

Knight, William, St. Johns, Newfoundland, for Model of Seal Fishery.

Kubitschek, H., Paris, for a variety of Dressing Cases, Necessaries, Cigar Cases, Snuff Boxes, &c.

Lobdell, H. C., Brookfield, Connecticut, for Imitation Tortoise Shell Combs of every style, Carved Horn and Buffalo Combs, Ladies' Dress Combs, &c.

Lockwood, C., Fulton-street, New York, for Children's Carriages, Propellers, Rocking Horses; Sheepskin Mats, Baskets, Brooms, &c.

Le Blond, J. D., Paris, for Mannikin of India Rubber and all its accessories, for the use of artists and sculptors.

Levysohn, J. H., Chevalier, The Hague, Holland, old chief of the Holland station at Japan, for collection of Japanese articles, including Coins, Minerals, and miscellaneous manufactures in great variety.

Meyer and Poppenhausen, New York, for specimens of manufactures in Whalebone and Artificial Whalebone, Canes, Patent Veneers, &c:

Meuschke, J. C., and Son, Altenburg, Saxe Altenburg, and various samples of Brushes.

Menier and Co., Paris, for superfine Chocolate.

Meyer, J. L., and Brothers, Wohlen, Canton Argovie, for samples of Twisted and Braided Straws, Cigar Cases, Tassels, &c.

Matthews and Hunt, New York, for new style of Carpet Bags—Cloth and Leather.

Mace and Boulanger, Paris, for Dressing Cases of various kinds.

Mendes and Martin, Leonard-street, New York, for Steam-made Confectionary and Fancy Chocolates.

Mogridge, Mrs., England, for specimens of Wax Flowers.

Ordway and Tilton, Cambridgeport, Massachusetts, for American Convex Hone Strap.

Pratt, Webb and Co., Maiden-lane, New York, for a Pyramid of Ivory Combs, and other articles in Ivory.

Pauly, William, Stratton Port, New York, for assortment of Fine Shell and Buffalo Horn Combs.

Perron, Paris, for decorated Chocolate of various descriptions.

Pearson and Sallada, Philadelphia, for specimens of Riding and Driving Whips.

Prichard, H., New York, for a large variety of Artificial Flies.

Rogers and Wyckoff, Courtlandt-street, New York, for specimens of India Rubber Shirred Webbing, and various articles made of India Rubber Cloth.

Ramella, G., Turin, for two Ivory Crucifixes.

Rose, William E., Reade-street, New York, for Canes in various kinds of wood, &c., mounted in gold and silver.

Shardlow, Samuel, Fulton-street, New York, for Ivory Billiard and Pool Balls; Martingal, Napkin, and Teething Rings; Sand, Pounce and Fancy Boxes; Wafer Stamps, Pen Holders, Draughtsmen, Counters, Checks, Cane Heads, &c., curious Box of many kinds of wood, embracing relics of the past.

Steer, James J., Pearl-street, New-York, for specimens of various styles of Paint and Varnish Brushes.

Storms, A. J., and H. E., Nyack, Rockland county, New York, for Wash Tubs, Buckets, Churns, and various other articles of cedar wood ware.

Sulzberger, Ackermann and Co., Meisterschwanden, Argovie, for specimens of Cabas, Cigar Cases, Tassels, and Straw Ornaments, Straw Ropes, Bleached Straw, &c.

Schmidt, F. G., Genoa, Sardinia, for specimens of Braids of Chips for Hats.

Saunders, George and Son, New York City, specimens of fine Razor Strops.

Smith, John J., New York, for Umbrellas, Parasols, and Walking Sticks, of all descriptions.

Seele, John P., New York, for Morocco and Velvet Cases of Jewelry.

Sangster, William and J., London, for Silk Parasols and Umbrellas of improved style.

Salleron, Benjamin, Paris, for variety of Fancy Paper Boxes, Envelopes, and Bonbon Cases for Confectioners.

Struelens, Nazaire and Co., Duane-street, New York, for specimens of fine French Confectionery and fancy Chocolates; Birds, Butterflies, &c., in sugar.

Tiercelin, Canal-street, New York, for a variety of Brushes for artists and painters.

Treloar, Thomas, Ludgate Hill, London, for various samples of Floor Mattings and Door Mats made of cocoa nut fibre.

Tamassia and Bazzoli, Mirandola, Modena, for Braids of Fine Willow Chips for Hats and Chip Hats.

Theodon, jun., and Requedat, Paris, for Riding and Driving Whips and Walking Canes, in whalebone, ebony, wood, &c., mounted in silver and gold.

Torsegno, G., Genoa, for two Vases in richly carved wood, gilded externally, and lined with copper.

Valle, S., Genoa, for Ivory Carving "Italy Weeping over the Tombs of the Martyrs in 1848."

Wildey and Co., Blackfriars Road, London, for specimens of the Fibre of the Cocoa Nut Husk in various stages of preparation; also, Matting and Netting.

Wise, George and Co., Tunbridge, Kent, England, for many varieties of Inlaid and Mosaic Tunbridge Ware.

Wirtz, J., Berne, Switzerland, for Fancy Boxes, Fans, &c., in carved and painted wood.

Zinn and Baruch, Redwitz, Bavaria,—agents, C. Zinn, and Co., New York City—for Fancy Willow Baskets.

Zuern and Rauftle, John-street, New York, for Fine Morocco Jewel Cases, Pocket-books, Portable Writing Desks, Work Baskets, and other articles of fancy leather.

Zeitler, J., Vienna, for tobacco Pipe Bowls and Cigar Holders of Ivory, Meerschaum, Amber, &c.

Honourable Mention.

Blank, Joseph D., Paris, for Ebony Looking-glass Frame, Souvenirs, and Porte-monnaies, richly ornamented with inlaid and Mosaic work.

Bode, John L., William-street, New York, for a Stuffed Bear, Stuffed Birds, and other Animals.

Beer & Co., Maiden-lane, New York, for Porte-monnaies and Cigar Cases of Leather, Mother of Pearl, &c.

Berrian, J. and C., New York, for specimens of Fancy Willow Baskets.

Boies, Leland and Co., Norwich, Connecticut, for Tool Handles of irregular forms.

Benker, G. A., Rotterdam, for a Pheasant House of East India Bamboo.

Brotherson, E. S., Demarara, for specimens of Indian manufactures, as Necklaces, Torches, Fans, Cassara Sifters, Shaak-shaaks, &c.

Brotherson, E. S., Demarara, for Bird Skins Stuffed.

Blanchard, Francis A., Lebanon, N. H., for "Murch's Patent Mop Head."

Bronson, Isaac L., Amsterdam, New York, for samples of Corn Brooms and Brushes.

Bosshardt, H., Nuremberg, Bavaria, for various articles carved in Stag-horn and Ivory.

Behl, F. G., Nuremberg, Bavaria, for a variety of Meerschaum Cigar Tubes and Pipe Bowls.

Beguin, A., Paris, for Fancy and Ornamental Boxes in Pasteboard, Leather, and other materials for Gloves, Handkerchiefs, Perfumeries, Bonbons, and Bijouterie.

Binet, Paris, for Wine Cellarets, &c.

Blair, George A., Smyrna, Tennessee—agents, J. and C. Berrian, New York—for specimens of Fans and Fly Brushes of Peacocks' Feathers.

Chapin, William, Institution of the Blind, Philadelphia, for specimens of Brushes and Fancy Bead Work, made by the blind.

Chaplain, Chas. L., Newark, New Jersey, for Hatchet, Axe and Tool Handles of Wood, Wheel Spokes and Whiffle Trees, turned by machine.

Chittenden Richard, Bexhill, Sussex, England, for a Truck Basket.

Cullen John, Pomeroon, British Guiana, for a collection of Indian Beads, Baskets, Flutes, Paddles Canoes, &c.

Crook, J. B., and Co., New York, for general assortment of Fishing Tackle.

Coons, M. P., Brooklyn, L. I., for King's Railway Washing Machine.

Croker, E. T., Syracuse, New York, for specimens of Wax Flowers and Fruits.

Cadligari, A., Lombardy, for different kinds of Strings for Musical Instruments.

Cochrane, Miss, Quebec, Canada East, for Wax Fruit.

Drais, William P., Philadelphia, for Wheel Brushes, for polishing enamelled teeth, jewellery, &c.

Dietz, J. P., jun., Nürnberg, Bavaria, for specimens of Brushes of various descriptions.

DeClerck, H., Haarlem, Holland, for Vulcanized India Rubber Tubes, Rings, Carriage Bearing Springs, Acoustic Tubes, Bands. &c.

Donald, James, for Bows and Arrows, Indian Hat with feathers, Quece War Club.

David and Chapuis, St. Claude Jura, France, for Snuff Boxes of various kinds.

Dumeril, S., Sons and Co., St. Omer, Pas de Calais, for various specimens of Clay Statuettes and Piper.

Dupre, Widow and Son, Turin, Sardinia, for Jewel Cases and Fancy Boxes, in shell, morocco, and various kinds of wood.

Edmonds, Alexander, Mount Pulaski, Illinois, for Horological Cradle.

Ebert, Frederic, Ansbach, Bavaria, for articles in Mosaic Straw.

Evans and Riggs, Newark, New Jersey, for Evans' Washing Machine.

Erhard, Reinhold, New York, for Fancy Wire Bird Cages.

Estublie, Gazagnare and Co., Marseilles, France, for Fishing Nets of Linen Thread.

Fechner, F., Guben, Prussia, for Artificial Flowers and Leaves, Gilt and Fancy Borders, Ornaments, &c.

Fleischman, A., Sonnenberg, Saxony, for Model in papier maché of "Gulliver among the Lilliputians."

Fabian, C. G., Breslau, Prussia, for "Pine Needle Wool" for Upholstery, intended as a protection from moths and for wadding; Wadded Blankets made of "Pine Wood Wool."

Fluck, Joseph, Switzerland, for a carved wood Goblet.

Fage, F., Demerara, for Bows, Arrows, Fans, Whips, Cassava Squeezer and Shaak Shaaks.

Gonnermann, Brothers, Nürnberg, Bavaria, for Artist's Pencils and Painting Brushes of various descriptions.

George, Paris, for a variety of fine Brushes.

Garassino, F., Savona, Sardinia, for a Picture in Wood, Mosaic.

Greig, The Misses, Brooklyn, L. I., for specimens of Shell Flowers.

Gibbs, L. H., Washington, D. C., for National Clothes Cleaner (Washing Machine).

Graham, George, Cincinnati, Ohio, for a collection of Wash Tubs.

Grosvenor, A. H., Harvard, Massachusetts, for samples of Brooms of Shaker manufacture.

Glennon, Elizabeth, Dublin, for a Case of Preserved Irish Game Birds.

Guyot, Paris, for Wine Cellarets, &c.

Herbst, K. H., Nuremberg, Bavaria, for Salad and other Spoons of Buffalo Horn.

Hanke, Emil, Brieg, Silesia, for Hardware.

Hatt, J. E. Leyst, Holland, for Chandelier of twenty-four lights, and a variety of smaller articles in buckhorn and ivory.

Holmes, W. H., Demarara, for articles of Indian manufacture—model of Buckhouse, &c.

Haring, James L., Piermont, New York, for a Case of Stuffed Birds.

Holberton, John W., New York, for Japanned and Painted Tin Toys.

Herrmann, Augustus, London, for Hair Bouquet, ornamented with Pearl.

Harrison, Miss Margaret, London, for specimens of Wax Flowers.

Hartgen and Hube, Hamburg, for Walking-sticks, in great variety.

Issmayer, J. M., Nuremberg, Bavaria, for a collection of Magnetic Toys.

Junker, J. G., Breslau, Germany, for a variety of Tin Toys.

Krauss, S., Rodach, Saxony, for Toys in Papier-maché, with moving heads.

Krischonig, A., Vienna, for Bouquets and Baskets of Artificial Flowers, Leaves and Fruit.

Kimball and Sawyer, Bedford, Massachusetts, for specimens of Pegs for Boots and Shoes.

Kern, John G., Geringswalde, Saxony, for a variety of Articles manufactured in Horn.

Kohler, F. B. Leipsic, Saxony, for assortment of Basket Ware.

Lusk, Adolph, Berlin, Prussia, for Wood and Leather Walking-sticks.

Maillard, H., and Co, for specimens of Ornamental Confectionery.

Maxheimer, J., and Brother, New York, for Fancy Wire Bird Cages.

Malaise, B., jun., Liege, Brushes and Broom-heads of various kinds.

Menkel, Anthony, New York, for Portfolios, Porte-monnaies and Cigar-cases.

Morrison, John R., Springfield, Ohio, for a Washing-machine.

Moore, Thomas, Thornhill, Canada West, for specimens of Axe-handles.

McClintock, W. C., Pomeroon, Guiana, for a variety of Indian manufactures, including Baskets, Dyes, Fans, Flutes, Gongs, Shields, Mats, Necklaces, &c.

Mechanics' Institute, St. John's, Newfoundland, for Groups of Birds—ptarmigan, ducks, owls, gulls, bitterns and loon.

Meyer, J. Z., Bremen, for Basket-ware and Cane Chairs.

Pepino, Giambattista, Borgo S. Dalmazzo, Turin, Sardinia, for three Vases of Flowers, carved in wood.

Pia, Brothers, New York, for variety of Pewter Toys.

Parsons, William B., New York, for specimens of Sand and Emery Papers.

Patterson, Harriet T., Water Valley, Erie County, New York, for a Wreath of Flowers made of Hair.

Probst, G., Nuremberg, Bavaria, for specimens of Combs in horn, ivory, and tortoise-shell.

Quebec Industrial Exhibition Committee, for a Money-purse, Table-mats, Knife-sheath, Mink and Muskrat Skin-bags, ornamented Moose Deer's and Cariboo Foot, Bark Work, Card Trays, Baskets, Cigar-cases, Fan, Watch-holders and Card-cases—prepared, manufactured and ornamented by the Lorette Indians.

Rock and Graner, Biberach, Würtemberg, for various assortment of Toys in Tin, Iron, Brass, and Papier-maché.

Rolger, Nuremberg, Bavaria, for samples of Brushes.

Rogers, Henry S., New York, for variety of Wax and Rag Dolls, dressed and Fancy Articles.

Ross, Mrs. Catharine, Cincinnati, Ohio, for Shell Monument to the Memory of Washington.

Roy, Ganivet, St. Claude, Jura, for Snuff-boxes of various descriptions.

Scheifele, G. S., New York, for an assortment of Mechanical Toys and meershaum Pipes from Austria.

Stegmüller, C., Paris, for Porte-monnaies.

Sangster, William and J., London, for Silk Parasols and Umbrellas of improved styles.

Smith, Isaac, Sons and Co., New York, for varieties of Umbrellas and Parasols.

Simon, W., Hildburghausen, Saxe-Meiningen, for Baskets.

Smith, T. L., John, New York, for Pocket and large Cases of Homœopathic Medicine; specimens of Sugar of Milk, and other articles used in Homœopathic practice.

Stanton, Robert S., New York, for variety of articles in Pearl and Mother of Pearl.

Schoun, Joseph, New York, for Porte-monnaies, Reticules, Work-boxes, in leather, steel, pearl and ivory.

Schneider, Peter, New York, for variety of Walking-canes.

Sloat, Miss Jane L. B., Piermont, Rockland County, for a Basket of Wax Flowers.

Somerville. J. McAlpine, Philadelphia, for Marine Algæ, or Preparations of Sea-weed.

Somze, Cadet H., Liège, Belgium, for military, railway, and other purposes.

Somze—Mahy, Belgium, several varieties of Brushes.

Shaw, Joshua, New York, for specimens of Glazier's Diamonds.

Schiller, Miss Caroline, Montreal, Canada East, for a large Bark Box elaborately worked with moose hair, &c.

Tuttle, George W., New York, for Swing and Baby Jumpers, Dressed Dolls, Portfolios, Necessaries, Newspaper Files, &c.

Thomas, Frederick J., New York, for Self-adjusting Door Alarm.

Taylor, Edward G., New York, for specimens of Daguerreotype Cases and Frames.

Thesen, N. P., Christiana, Norway, for various stuffed specimens of Norwegian Animals.

Thesen, N. P. Norway, for variety of objects carved in wood by the Norwegian Peasantry.

Taggart, John, Demerara, for Bow and Arrows, War Club, &c.

Viel, Paris, for variety of Canes.

Vander Hoop, J. P., Bremen, for Artificial Flower Bouquets in Frames by Eberlain.

Urian, John and Co., Philadelphia, for specimens of Confectionery.

Wegelin, D., Canton of Berne, for Fancy Boxes and other articles, and Carved and Painted Wood.

Weppler, C. L. Heilbronn, Wirtemburg, for specimens of articles in Straw Mosaic Work.

Wright, Miss Gertrude, Moneymore, County Derry, Ireland, for specimens of Wood Carving.

Woodburn, Jacob, Agent, St. Louis, Missouri, for Spokes from the St. Louis Spoke Factory.

Wheeler, E. S. and Co., New York, for variety of Buttons.

Walton, Mrs. Gen. Ezekiel P., Montpellier, Vermont, for Head of Washington in Shellwork.

Wilson, Peter, (of the Cayuga tribe of Indians,) Versailles, New York, for articles manufactured by the Cayuga Indians.

Wissmath, J. A., Nuremberg, Bavaria, for Snuff, Tobacco and Cigar Boxes.

Weidinger, P., Leipsic, Saxony, for Umbrellas and Parasols.

Zorn, Mrs., Bethlehem, Pennsylvania, for Wreath of Flowers made entirely of hair.

Ziener, C., Nuremberg, Bavaria, for specimens of Ivory Carvings.

JURY L.

Class 23.—Works in Precious Metals and their Imitations; Jewellery, and other Personal Ornaments, except Bronze and Articles of Vertu, which were transferred to the action of Jury O.

Jurors.

ROBERT RAIT, Esq., Chairman.
FREDK. CLAYBROOK, Esq., Secretary.
SAML. T. CROSBY, Esq.

Silver Medal.

Ball, Black and Co., New York, for fine specimens of Gold Presentation Plate and articles of Silver Ware.

Boland, Louis T., New York, for superior Crests.

Bailey and Co., Philadelphia, for articles of Silver Ware and general utility.

Bolzani and Co., Vienna, for Jewellery and Snuff-box.

Coles and Co., Albert, New York, for superior specimens of Dessert, Fish, and Butter Knives.

Cristofle and Co., C. C., Paris, France, elegant Dinner Service in Electroplate.

Dutertre, August, Geneva, Switzerland, for fine Jewellery.

Elkington, Mason, and Co., London, for elaborately wrought Classical Designs in Electro-plate.

Garrard and Co., R. S., London, for elaborate and elegant specimens of Equestrian Subjects in Silver.

Grebe, J. B., Rotterdam, for novel Silver Beaker in one piece.

Hunt and Roskell, London, for elaborately wrought Classical Silver Ware and Jewellery of superior design and execution.

Linherr and Co., New York, for superior Hair Work.

Marchand, Sr., Gaime, Guillemot, and Co., New York, for Diamond Jewellery of superior design and execution.

Odiot and Son, Paris, for elegant and elaborate Vases and Tea Services.

Peckham, Dennis and Co., for fine specimens of Gold and Silver Chessmen.

Pincet, J., New York, for superior fine Gilding.

Rudolphi, F. J., Paris, for Silversmith's Work, Jewellery, &c.

Sharp, Thomas, London, for Silver Cups and Table Centre Pieces.

Tiffany and Co., New York, for elaborately wrought Classical Silver Ware and Jewellery of superior design and execution.

Terond, Ravier and Co., Geneva, Switzerland, for articles of fine Jewellery.

Bronze Medal.

Appleton, Geo. S., New York, two Bronze Medals of Clay and Webster.

Ames, Jas. T., Chicopee Falls, Plated Ware.

Angel, Joseph, London, fine specimens of enamelled Silver Ware.

Bennatje, Giuseppe, Genoa, Italy, Silver Filagree Statute of Columbus.

Bosi, Enrico, Florence, Tuscany, Brooches and Bracelets of Florentine Mosaic.

Carr, L. and D. S., Providence, United States, superior Gold Lockets.

Cassali, S., Rome, Italy, Cameos cut on shells.

Capt, H., Geneva, Switzerland, fine Jewellery, with special approbation.

Cappello, Bro., Turin, Jewellery.

Demarini, G., Genoa, Italy, Coral Ornaments.

De Meyer, P., Hague, Silver Ware and Silver Urn.

Friedman, Joseph, Frankfort-on-the-Maine, fine Jewellery.

Greik, G., Amsterdam, Silver Plated Ware.

Grandjean, Perennod, H. V., Chaux-des-Fonds, Switzerland, two Gold Plates engraved.

Hermann, Augustus, London, Hair Bouquet, ornamented with Pearl.

Haulick, G. F., Hanau, fine Jewellery.

Johnson, Henry F., United States, new and improved Faucets.

Kuhns, E., Nürnberg, Germany, gilded and silvered Wire.

Link & Bros., Robt., New York, fine Hair Work.

Lelong, Paris, imitation Pearls.

Muzarelli, Bologna, rose coloured Coral Ornaments.

Merkel, Schwalbach, Bavaria, "Leonischen" Wire.

Ott and Co., Nicholas, Gmund, Würtemberg, fine Jewellery.

Presburg and Co., M. J., Niemegen, Silver Snuff Boxes and Spectacle Cases.

Poggi, A., Genoa, elegant Carvings in Coral.

Reed and Barton, Massachusetts, superior Britannia Ware.

Raffaeli and Sons, Leghorn, Tuscany, Coral Ornaments.

Rogers and Bros., Hartford, Plated Ware.

Stone, Weaver, and Co., Providence, superior Gold Locket.

Skidmore, Francis, and Son, Coventry, England, Sacrament Service, Antique Challices, Ancient Binding i Silver.

Smith, Nicholson and Co., London, fine specimens of artistic Silver Ware.

Society of Arts, London, for Swiney Prize Cup.

Sachs, E., Stuttgart, fine Jewellery.

Sax and Co., Waldkirch, Garnet Necklaces.

Waterhouse, G. and S., Dublin, ancient Tara Brooches, Irish Pearls.

Honourable Mention.

Adams and Kidney, New York, Service of Silver Plate.

Aaron, Brothers, Torquay, Jewellery in Malachite and Silver.

Berrian, J. and C., New York, specimens of Silver Plated Ware.

Bagley, Josiah, Cincinnati, Pearl Pin, Agate and Coral Rings and Fancy Baskets.

Begman, Max, Vienna, Austria, Gilded Jewellery.

Bussi and Co., G., Turin, Parure in Pearls and Brilliants, and Brooch in Enamelled Gold and Brilliants.

Bauer, ——, Nürnberg, Gold and Silver Leaf.

Chamberlin, Joseph, New York, Electro-plated Ware.

Cox, John, and Co., New York, Silver-plated Candelabra.

Crane, Wm. H., New York, Gold Foil and Leaf.

Dubois, A., Chaux-des-Fonds, Switzerland, Engraving on Gold.

Derriey, ——, Geneva, Switzerland, Enamelled Paintings on Gold and Tea Services.

Farquharson, C. H., Edinburgh, Scotland, Specimens of Scotch Jewellery.

Hellman, W. H., New York, Gold Leaf and Foil.

Hattersley and Dickinson, Newark, N. J., Silver-plated and Brittania Ware.

Keyworth, R., Washington, D. C., Casket in Gold and Silver.

Kundert Fritz, Neufchatel, Switzerland, Watch-cases Engraved.

Kemp, W. H., New York, Gold Leaf and Foil.

Loskamp, Roswag and Speis, New York, Jewellery in Gold, Pearl, and Coral.

Montefiori, C., Turin, Portrait of the Queen of Sardinia, chased on Silver Plate in alto-relievo.

Nicolet, A., Switzerland, Engraved Tablet on Silver.

Overbaugh, A. W., Brooklyn, "Lord's Prayer" engraved on a Gold Dollar.

Penny, John, London, specimens of fine Metal Chasing and Embossing.

Plant and Hooper, New York, Gold Leaf and Foil.

Ransley, Robt. H., Philadelphia, Gold Leaf and Foil.

Smith, Deey, and Eddy, New York, Gold Lockets, Chains, Breastpins and Heiss' Patent Lever Studs.

Smith, S. W. and Brother, Britannia and Plated Ware.

Schoeller, ——, Berndorf, German Silver and German Silver Plated Ware.

Schaptag, Nürnberg, Gold and Silver Leaf.

Tice, Wm. R. Brooklyn, California Gold Ring.

Veyrat, A., France, specimens of Fine Silver Ware.

Volkarnebi, Junior, and Fuerster, Nürnberg, Gold Leaf and Foil.

Waugh, Jas. L., New York, Gold Leaf and Foil.

Wallace, J. and A., New York, Gold Leaf and Foil.

Weaver, F., Williamsburgh, Goblet and Candlestick in Silver.

Jury La.

Part of Classes 24 and 25.—Glass Manufactures. Porcelain and other Ceramic Manufactures.

Jurors.

JOHN C. JACKSON, Esq., 113, Water Street, New York, City, Chairman.
WM. P. HACKER, Esq., Philadelphia, Pennsylvania.
W. COWLES, Esq., Baltimore, Maryland.
AUGUSTUS C. DOWNING, Esq., 108, Fulton Street, New York City.
ROBERT C. WETMORE, Esq., New York City.
EBENEZER COLLAMORE, Esq., New York City.
JOHN R. MUMFORD, Esq., Reporter and Secretary, 101, Pearl Street, New York City.

Silver Medal.

Brooklyn Flint Glass Company, Brooklyn, New York, for their discovery in compounding Materials for making Glass, by which a superior brilliancy of colour is produced, and for their beautiful display of rich cut Flint Glass.

Brooklyn Flint Glass Company, Brooklyn, New York, for their discovery in making Pressed Glass, Dioptric Lenses, and Signal Lamp Glasses for Railways, Ships, and Steamers.

Cartlidge, Charles, and Co., Green Point, New York, originality in the manufacture of Porcelain Door Knobs and Door Plates.

Minton, Herbert and Co., Stoke-upon-Trent, Staffordshire, England, for Patent Encaustic Tiles, an original and beautiful article.

Bronze Medal.

With Special Approbation.

Bourne, Joseph, and Son, Denby, near Derby, England, for Patent Vitrified Stone Jugs, Ink Bottles, &c.

Derndinger, J. A., Sohler, and Co., Offenburg, Baden for the best Coloured and Embossed Window Glass and Drawings on Glass.

Giacomuzzi, J. and Brothers, Venice, for Mosaic Tables.

Hannington, William J., New York City, for the greatest variety of Subjects and Designs of Stained Glass.

Haughwout and Dailey, New York City, for a superior order of American Decorations on French Porcelain.

Haviland, Brothers, and Co., Limoges, Haute Vienne, France, for a large display of highly decorated French Porcelain of general excellence.

Imperial Manufactory, Sevres, France, for finest texture of body, perfect form, and superiority of finish of French Porcelain.

Mayer, T. J. and J., Longport, Staffordshire, England, for a superior order of Decorated Earthenware, embracing a variety of the staple articles and Plumber's Ware.

Maes, L. Joseph, Crystallerie de Clichy, Paris, France, for Fancy Coloured and Cut and Enamelled Glass.

Minton, Herbert and Co, Stoke-upon-Trent, Staffordshire, England, for Statuettes, Groups, and various articles in Parian.

Rose, John and Co., Coalbrook Dale, Shropshire, England, for English China Vases, Tea and Dinner Sets, richly decorated.

Weinmer, of Munich, for Painting on Porcelain, in frames.

Wetzstein, Vincent, Prague, for Table Ornament of polished rock crystal.

Bronze Medal.

Booh and Brothers, Green Point, New York, for Door and Stair Furniture Porcelain.

Bland, Samuel K., Lisson Grove, London, England, for Enamel Painted Windows, with Cromo-crystal decorations.

Breffit, Edgar, Castleford, Yorkshire, England, for Specimens of superior Glass Bottles with Patent Stoppers.

Brettschneider, W. C., Altenburg, Saxe-Altenburg, for various Paintings on Porcelain in Frames.

Brettschneider, A., Altenburg, Saxe-Altenburg, for various Paintings and Porcelain.

Berger, Walter (Moselle Glass Works), Paris, France, for Crystal and Coloured Glass Door Knobs and Balustrade Ornaments.

Bapterosses, Briare Loriet, France, for a beautiful display of fancy and plain Ceramic Buttons.

Bing, Brothers and Co., Paris, France, for richly ornmented Porcelain Vases.

Bell, Messrs., Quebec, Canada East, for Specimens of Earthen Ware.

Cooper and Belcher, Camptown, New Jersey, for Engraved and Etched Ornamental Window Glass.

Copeland, Alderman, W. T., London, England, fancy ornamented Mantle Slabs, Table Tops, &c., and Paintings on China in frames.

Copeland, W. T., London, England, for a superior order of Parian Statuary.

Fasolt, Ens and Greiner, Lauscha, Thuringen, for Imitation Agate Marbles in Glass. Glass Eyes for birds and dolls.

Fischer, M., Herende, Hungary, for fine Porcelain Hungarian Vase, &c.

Garnkirk Coal Company, near Glasgow, Scotland, for Fire Clay Vases, Pedestals, Fancy Chimney Tops, &c.

Hale, Frederick and Co , New York City, for Enamelling and Writing on Glass in Burnished Gold.

Hermann, Louis E., Hoboken, New Jersey, for American Decorations on French Porcelain.

Holland, William, St. John's, Warwick, England, for Imitations of inlaid Marble in Glass Plates.

Hammill, John Baptiste, Bridgewater, near London, England, for Patent Vitrified Stone, Drain Pipes, &c.

Hache and Pepin-Lehalleur, Limoges, France, for Decorated French Porcelain.

Kanitz, C., Vienna, Austria, for Coloured and Enamelled Glass Beads, Bugles, Brooches, and other Ornaments.

Lahoche, Paris, France, for superior Rich Cut, Engraved, and Enamelled Glass.

Lahoche, Paris, France, for elaborate design and execution of Decorations on Sevres China.

Minton, Herbert and Co., Stoke-upon-Trent, Staffordshire, England, for a superb Parian and Gilt Dessert Set.

Mullenbach and Thewald, Hohr, Germany, for superior Specimens of Stone Ware.

Maes, L. Joseph, Crystallerie de Clichy, Paris, France, for superior cut Crystal Glass.

New England Glass Company, Boston, Massachusetts, T. D. Moore and Co., Agents, New York City, for superior Pressed Glass.

New England Glass Company, Boston, Massachusetts, for fancy, cut, plated, and enamelled Coloured Glass.

Nieuvergeld, J. R. F, Hague, Netherlands, Holland, for Electro-Coppered Glass Stills.

Patoux, Drion and Co., Aniche, France, for the best Cylinder Window Glass.

Ridgway, John and Co., Cauldon Place, Staffordshire Potteries, England, for richly decorated China Tea and Dessert Pieces.

Royal Porcelain Manufactory, Berlin, Prussia, for a fine China Vase, and various articles of beautiful Decorated China.

Scheifele, G. S., Importer from Austria, for fancy Bohemian Glass Ware.

United States Pottery Company, Bennington, Vermont, for Fenton's Patent Flint Enamelled and Parian Ware.

Honourable Mention.

Adams, W. and Sons, Stoke-upon-Trent, Staffordshire, England, for samples of Staple and Decorated Earthen Ware and Parian Figures.

Arnoldi, C. E. and F., Elgersburg, Saxe Gotha, Pharmaceutical Utensils and Water Pipes.

Bodine, G. M., New York City, New York, for Lunette Watch Crystals.

Berger and Walter, New York City, New York, for Watch Glasses and Cut Glass.

Bridgewood, Sampson, and Son, Longton, Staffordshire, England, for White and Gilt English China.

Brunswick, Hyman, New York City, for Exhibition of of Figures in Wax.

Boote, T. and R., Burslem, Staffordshire, England, for Parian and Decorated Doric and Mosaic Vases and Figures.

Bucker, H., Dresden, Saxony, for Paintings on Porcelain.

Blaschka and **Sons**, Liebenau, Bohemia, Austria, for Glass Buttons and Beads.

Doulton and **Watts**, Lambeth and Liverpool Potteries, England, for Stone Jars, Water Filters, &c.

Finch, John, City Road Basin, London, England, for Porcelain Baths and Glazed Bricks.

Gosse, Paris, France, specimen of Porcelain articles, fire proof.

Giacommuzzi, J. and **Brothers**, Venice, for Corals and Enamelled Work.

Hellmich, F. A., Wolfersdorf, Bohemia, for samples of Glass Beads.

James, William Henry, Camden Town, England, for Window Glass, ornamented by machinery.

Krantz, J. H., Neumarkt, Silesia, for Glass Buttons and Beads.

Keil, Joseph, Gablonz, Austria, for Glass Buttons and Beads.

Lisci, Marquis Ginori, Florence, Tuscany, Italy, for fine Porcelain Vases, &c.

Minton, Herbert and **Co.**, Stoke-upon-Trent, Staffordshire, England, for Earthenware Garden Pots, &c.

Mittelstadt, W., Zirke, Posen, for specimen of Glass Ware, Tumblers, &c.

McLaren, Yamaska, Canada East, for specimens of Roofing Tiles, Bricks, &c.

Netherlands Society, Zwyndrecht, near Dordrecht, Netherlands, Holland, for Glass Cylinders.

Potter, Addison, Wellington Quay, near Newcastle-upon-Tyne, England, for Fire Clay Gas Retorts.

Pillivuyt, L. **Andre Chas.** and Co., Paris, France, for a variety of fine and ornamental French Porcelain.

Pazelt, A., Turnau, Bohemia, Austria, for Artificial Stones of Coloured Glass.

Rees, Thomas and Co., Limoges, Haute Vienne, France, for fancy and plain French Porcelain.

Stouvenal, Joseph and **Brother**, New York City, New York, for a display of Cut Glass.

Stephenson, Matilda C., East Brooklyn, New York, for Stained and Painted Glass.

Scheifele, G. S., (importer from Austria,) for Bohemia Porcelain.

Trost, William, Nuremberg, Bavaria, for Painting on Glass.

Van Leempoel de Colnet and Co., near Chapelle, Aisne, France, for French Glass Bottles.

Vicart, L. and Co., Graville, Seine Inferieure, France, for Glass Bottles and Demijohns.

Jury M.

Class 30.—Musical Instruments.

Jurors.

WILLIAM NORRIS, Esq., Chairman, Philadelphia.
GEORGE T. BRISTOW, Esq., Secretary, New York.
WILLIAM H. FRY, Esq., Reporter, New York.

Mons. EMILIE GIRAC, New York.
LEOPOLD MIGNEN, Esq., Philadelphia.
THEO. EISFELDT, Esq., New York.
R. STORRS WILLIS, Esq., New York.
ALFRED BOUCHER, Esq., New York.
Mons. L. G. JULLIEN, London, England.
MAX MARETZEK, New York.

Silver Medal.

Debain, Paris, Harmonium, a magnificent instrument.

Debain, Paris, a Mechanical Piano, very ingenious.

Bronze Medal.

Bruno and **Cargill**, New York, Flute, fair, Cornet; fine.

Bray, John, Dublin, Harp.

Brown, John F., New York, harp.

Bassford, A., New York, Grand Piano, feeble tone, improved action.

Bassford, A., New York, Square Piano, three strings, a remarkably fine and brilliant instrument.

Cerveny, W. F., Königgratz, Bohemia, Phonikon, a superior instrument, ingenious arrangement for changing keys.

Dodworth, A., New York, Cornet, with valuable improvement; Trumpet, fine; Alto Horn, fine.

Eisenbrandt, New York, Flutes—Ivory, a bad material; Silver Metallic, objected to; Gold Mounted with Stones, such ornaments should be omitted; Clarionets, fine, the number of keys an impediment; Flageolets, fine.

Erard, Paris, Grand Piano, most vocal, but does not hold its tone.

Erard, Paris, Upright Piano, a brilliant instrument.

Firth, Pond, and Co., New York, Square Piano, three strings, in part.

Gemunder, Geo., New York, Violin, (contra bass,) excellent.

Gemunder, Geo., New York, Church Organ, many beautiful qualities, but the diapason wanting.

Grovesteen and **Truslow**, New York, Piano, two strings, (Rosewood,) an excellent instrument; do., (Papier Maché,) splendid workmanship: a brilliant Piano.

Gilbert, New York, Piano, two strings, Æolian attachment, fine, Prince and Co., manufacturers.

Hechinger, F. Ulm, Wurtemberg, Church Organ, very superior instrument, and for small Organ, Case very plain, but an excellent instrument.

Huni and **Hubert**, Switzerland, Grand Piano, very fine instrument; square Piano, three strings, superior instrument, powerful tone.

Hazelton and **Bro.**, New York, Piano, two strings.

Jacobs, New York, Accordeons, improved Reeds.

Johnson and Co, L., Philadelphia, specimens of Music Printing and Types; Special Mention.

Klemm, G. and A. Markt Neukirchen, Saxony, Cornet and Alto Horn.

Kanitz, Vienna, Austria, Accordions.

Lauter, New York, Wind Instruments all fine.

Lighte and **Newton**, New York, Square Piano, three strings in part, excellent instrument, diapason new and good.

Lankota, New York, Piano, two strings.

Ladd, A. W., New York, Piano, two strings, small size, a remarkably good instrument of small size, for a low price.

Mirmont, New York, Violins, all fine instruments.

Marten, Penn., Guitars.

Pelitti, Giusseppe, Milan, all superior instruments.

Pleyel, Paris, Upright Piano, the best instrument.

Prince and Co., manufacturers, William Hall and Son, New York, Agents, Melodeon, a handsome instrument.

Ruhlmann, Carl, Rudolstadt, Thuringen, various wind instruments.

Scates, Jos., Dublin, Concertinas, good instruments.

Stodart, W. and **Son**, London, Grand Piano.

Schomaker and Co, Philadelphia, Piano, two strings.

Trayser, P. J., Stuttgart, Seraphine, fine instrument.

Zoebisch and **Sons**, New York, Sax and Bass Horns.

Ziegler, J. B., Quebec, Cornopeon, ingenious.

Honourable Mention.

Cerveny, W. F., Königgratz, Bohemia, Trumpet, Bugle, Honourable and Special Mention.

Gemunder, Geo., New York, Violins, all good instruments.

Hallet and **Davis**, Boston, Square Piano, three strings, in part.

Hewes, Geo., Boston, Square Piano, three strings, in part.

Knabe, Piano, two strings (pearl keys).

McDonald and **Bro.**, New York, Piano, two strings, Euterpian attachment, ingenious; metallic keys in bad taste.

Neff, Jos., New York, Violins.

Tilton, New York, Guitars.

Remarks.

Gardner, Wm. P., New Haven, Melodeons, weak and in bad taste.

O'Neill, P. C., Harp, decidedly bad.

Tilton, improvement is good for guitars, but not for violins.

The Violins not noticed, although some are of elaborate workmanship, were pronounced unfit for competition.

Many of the Guitars were of exquisite workmanship, but bad tone.

Banjos esteemed barbarous, and passed as unworthy of notice.

Keyed-Stop Violins, unartistic and injurious to art.

Sub-Jury on Billiard Tables.

Gen. NORRIS. THEO. EISFELDT, Esq. LEOPOLD MINGEN, Esq.

Bassford, Bronze Medal with a Special Mention, best Table on exhibition.

Winans, Bronze Medal.

Leonard and Benjamin, Honourable Mention.

Jury N..

Class 17.—Paper and Stationery, Types, Printing and Bookbinding, and Specimens of Ornamental Penmanship.

Jurors.

A. B. CLARKE, Esq., Chairman.

HENRY V. BUTLER, Esq.
W. H. APPLETON, Esq.
A. N. LEWIS, Esq.
J. A. ORTELL, Esq.
C. VAN BENTHUYSEN, Esq.
R. GRANT WHITE, Esq.
F. W. BELL, Esq.
CHAS. B. NORTON, Esq.
CHAS. SHERMAN, Esq.
E. J. DANFORTH, Esq.

Silver Medal.

Baker, Godwin and Co., New York City, for Fancy Job Printing, and Press Work with Honourable Mention.

Brown, Delwin F., Brooklyn, New York, for best specimens of Off-hand Commercial and Ornamental Penmanship and Pen-drawing, with special approbation for unequalled skill in his art.

Bagley, A. G. and Co., New York City, for best Gold Pens and Pencil Cases.

De La Rue, Thomas and Co., London, for excellent Paper, and commendation for variety and excellence in all parts of the manufacture.

Mathews, William, New York City, for excellence in Bookbinding with special approbation.

Bronze Medal.

Blanchet, Brothers and Kleber, for excellent Writing, Drawing and Letter Paper.

Barbat, J. M., Chalons, France, for Chromo-Lith. Printing and Design of Press Work.

Brown, J. M., and Co., New York City, for general excellence in Blank Book Binding.

Beers, James B., New York City, for Improved Pen and Pencil Cases and fine gold pens.

Carew Manufacturing Company, South Hadley Falls, Massachusetts, for superior fine Writing Papers.

Dupont, Paul, St. Honoré, Paris, for superior Printing.

Faber, A. W., Stein, near Nuremberg, for excellence and variety of Lead Pencils and Drawing Chalks, and their adaptation to all purposes.

Fleming, A. B. and Co., Leith, Scotland, for excellent specimens of Printing with Scotch Ink.

Figgins, V. and J., 17 and 18, West-street, Smithfield, London, for beautiful specimens of Fancy Types.

Foley, John, New York City, for fine Gold Pens.

Hollingworth, Thomas and John, Maidstone, Kent, England, for excellent Drawing, Writing, and Printing Papers.

Lippincott, Grambt and Co., Philadelphia, Pennsylvania, for elegant specimens of Printing and Binding.

Platner and Smith, Lee, Massachusetts, for general excellence of Writing Papers.

Piquette, C., Detroit, Michigan, for specimens of very superior Gold Pens.

Root and Anthony, New York City, for fine Blank Books of superior style of Ruling.

Saunders, Thomas H., Dartford, Kent, England, for very superior Bank Note, Cheque and Water-marked Writing Papers.

Tobitt, John H., New York City, for Combination Types.

Wheeler, Asa H., New York City, for superior specimens of Ornamental Penmanship and Pen Drawing.

Honourable Mention.

Brookman and Langdon, London, for superior Lead Pencils.

Binger and Son, Amsterdam, Holland, for excellent Glyptographic Printing.

Badeker, J., Iserlohn, near Elberfeld, Prussia, for his Bibles and Geographical Works.

Bunce, George, New York City, for beauty of Types.

Blanzy and Co., Boulogne Sur Mer, France, for great variety and excellence of Steel Pens.

Bill, Stark and Co., Willimantic, Connecticut, for superior specimens of Wood Type cut by machine.

Chico and Mina, Turin, Sardinia, Italy, for beautiful Press Work.

Curmer, Alexander, Paris, France, for Stereotype Work and Papier Maché.

David, Thadeus, New York City, for best Sealing Wax.

Dunigan, Edward, and Co., New York City, for specimens of superb and elegant Book Binding.

Felt and Hosford, New York City, for Atmospheric Pressure Inkstands and Superb Blank Books.

Frere Thomas, New York City, for fine collection of Valentines of Embossed Lace Paper.

Gillott, Joseph, England, for best Steel Pens.

Hamilton, Alfred, New York City, for variety and beauty of business and Enamelled Cards.

Johnson, L. and Co., Philadelphia, Penn., for excellent specimens of Types and peculiar convenience in casting them.

Koch and Co., New York City, for specimens of Blank Book in a superior style of Ruling, Binding and Finishing.

Knapp and Rightmyer, N. Y. City, for an excellent Published System of Penmanship.

Long, Fred. A., New York City, for fine specimens of Embossed Cards and Envelopes.

Maynard and Noyes, New York City and Boston, for best Writing Ink.

Mangin, F. L., Bruyeres Varges, France, for superior specimens of Ink.

Manice, William H., Philadelphia, Penn., for superior Ledger and Journal.

Niedree and Co., Paris, France, for superior specimens of Book Binding.

Prince, N. A., Brooklyn, New York, for a Spring Fountain Pen, with special reference to its utility.

Phineas, Meyer, New York City, for excellent Steel Pens.

Persson, Ira B., New York City, for fine specimens of Card Writing and Drawing.

Rauch, Brothers, Heilbronn, Wurtemberg, for specimens of fine Writing Papers.

Rose, William W., New York City, for Bank and Office Ledger and Account Books.

Staedtler, Nuremberg, Muller and Co., New York City, agents, for Lead Pencils and Drawing Chalks.

Stephenson, Blake and Co., Sheffield, England, for fine form of Types and Sharpness of Impression.

Tracy, John P., for superior Ornamental Penmanship.

Thompson, William M., New York City, for Pictorial Stamps.

Wilson, James Leonard, 128, St. John-street, London. for excellent Cloth for Bookbinding.

Walker, E., and Sons, New York City, for specimens of substantial and elegant Bookbinding and richly Illuminated Edges.

Wiley, William E. and Co., Birmingham, England, for excellent Gold Pens.

Jury O.

Class 31.—Fine Arts, Sculpture, Painting, Engravings, &c., Bronzes, and Articles of Vertu from Class 23.

Jurors.

Professor S. F. B. MORSE, Chairman.

HENRY ULKE, Esq.
EDW. ANTONISSEN, Esq.
WM. YOUNG, Esq., Albion Office.
HYPPOLITE SERBON, Esq.
A. B. DURAND, Esq.
Prof. E. FELIX FORESTI.
C. A. DANA, Esq., Tribune Office, Sec.
W. W. CORCORAN, Esq.
H. K. BROWNE, Esq.
C. L. ELLIOTS, Esq.

New York, Dec. 9, 1853.

To Messrs. B. Silliman, Jr., B. P. Johnson, Samuel Webber, Commissioners of Juries.

In presenting their Awards to the Commissioners, Jury O, charged with the various Collections of Objects of Art, exhibited in the Crystal Palace, deem it proper to state that they have considered each Department separately, and that their intention is simply to mark the degrees of excellence in each, without instituting any comparison between the different branches. Thus, a Medal awarded to a Statue does not indicate that it is superior or inferior to a Picture or an Engraving to which a similar or a different Medal may be awarded; but simply that measured by the standard of excellence in its own branch, the Jury regarded it as worthy of such distinction. With this Explanation, the following Awards are announced.

Silver Medal.

Carstensen and Gildemeister, U. S., for Design of the Crystal Palace.

Graillon, M., Dieppe, France, for Groups in Terra Cotta.

Kiss, August, Berlin, Prussia, for Group in Bronze,—The Amazon.

Bronze Medal.

Betti, Francesco, Italy, for a Mosaic Table Top.

Cordier, M., Paris, France, for two African Heads in Iron.

Duplan and Salles, Paris, France, for a Dying Heron, in Bronze.

Dupont-Henriquel, France, for an Engraving on Steel,—The Hemicycle, after Paul Delaroche.

Dujardin, L., Arcueil, France, Engraving on Wood,—A Subject from Proudhon.

Fremiet, J. B., Paris, France, for Group in Plaster of the Bear and Hunter.

Magni, Pietro, Italy, for a Statue in Marble of the Industrious Child.

Ottin, A., Paris, France, for Composition in Plaster,—"The Triumphal March of the Republic."

Honourable Mention.

Antigna, A. France, for Oil Painting,—Inundation of the Loire.

Ball, T., U. S., for Statuette of Webster, in Plaster.

Crawford, Thomas, U. S., for Bust of a Lady, in Marble.

Fraikin, C. A., Belgium, for Child Sleeping in a Shell, in Plaster.

Girardin, Pauline, France, for Several Water Colour Paintings of Groups of Flowers.

Giampaoli, D., Lucca, Italy, for "Death of Feruccio," in Marble.

Grolly, Versailles, France, for Oil Painting,—View near Paris.

Gude, Hans, Düsseldorf, Prussia, for Oil Painting,—Mountain Scene in Norway.

Gurlitt, Louis, Hamburg, for Oil Painting,—Sunset near Naples.

Gayrard, P., Paris, France, for Bust of Madame Cerito, in Marble.

Holl, W., England, for Engraving on Steel,—The Merry Making.

Hasenclever, J. B., Düsseldorf, Prussia, for Oil Painting,—The Deputation of Workmen.

Hubner, C., Düsseldorf, for Oil Painting,—The Intercepted Love Letter.

Jerichau, A., Denmark, for Group of Adam and Eve, in Plaster.

Jacquemard, A., Paris, France, for Tiger, in Plaster.

Kneeland, Horace, U. S., for Bust of Captain Ericcson, in Plaster.

Lerolle, Paris, for a Small Bronze Vase with Cupids.

L'Eveque, Paris, France, for Statue of Lesbia, in Marble.

Marshall, W. Calder, England, Statue of Sabrina, in Plaster.

Orr, J. W., U. S., for Sundry Specimens of Wood Engraving.

Pagani, Pietro, Milan, Italy, for Eve after the Fall, in Marble.

Powers, Hiram, U. S., for Greek Slave, and other Works in Marble.

Ringuet, Le Prince and Marcotte, Paris, France, for the Workmanship of a Large Bronze Vase.

Quillerie, M., France, for Two Compositions in Relief, representing,—the one a Battle,—the other a Religious Procession.

Santarelli, Emilio, Florence, Italy, for Statue of Harpocrates, in Marble.

Serrure, A., Belgium, for Oil Painting,—The Lovers' Meeting.

Spitzweg, A., Munich, Bavaria, for Oil Painting,—The Bookworm.

Soules, Eugene, France, Water Colour Painting,—a Landscape.

Vacher, C., England, for Water Colour Painting,—View of St. Peter's.

Vatican, Manufactory of the, Rome, for a Mosaic Copy of St. John.

Van Schendal, P., Brussels, Belgium, for Oil Painting,—A Flemish Market Woman.

Wilmore, J. T., England, for Steel Engraving,—Deer-stalker's Return,—after Landseer.

ADDITIONS.

JURY A.

Silver Medals.

Curtis, Jas. D., New York, for the manufacture of Iron and Steel of excellent quality from "Franklinite."

Ziervogel, W., Director of the German Pennsylvania Coal Co., Treskow, Pa., for collection of ores, half metal, powder, pure metal, &c., illustrating a process for separating silver from copper.

JURY B.

Bronze Medals.

Cerceuil, France, for Pulverized Flocks.

La Veille Montagne Zinc Company, France, for Oxyd of Zinc.

Lobach and Schepeler, New York, for Vanilla Beans.

Jeffries and White, U. S., for specimens of Sulphur.

Rowe, T. G. and A. L., New York City, for Linseed Oil.

Honourable Mention.

Ballard, O. W., 415, Broadway, for Hair Dye.

JURY C.

Silver Medal.

Gale, ——, for the Originator of a valuable New Variety of Winter Wheat, called "Gale Wheat."

Bronze Medal.

Yeatman, Cincinnati, for still Catawba Wine.

JURY F.

Silver Medal.

Blake, Wm. P., New York City, for a Goniometer of very Superior Construction.

Bronze Medals.

Adams and Tagliabue, for Hydrometers: with special commendation for accuracy.

Blanquart, Evard, France, for a collection of beautiful Photographic Pictures, with special approbation.

Dobyn and Richardson, New York, for fine Daguerreotypes; with Honourable Mention.

Duboscq-Soleil, Paris, France, for beautiful Stereoscopic Pictures, with special approbation.

Hoffman, Louis C., New York City, for Hydrometers and Graduated Jars, with special commendation for accuracy.

Mayal, E., for Four beautiful Views of the Exhibition of 1851, and a fine Portrait; with special approbation.

New Jersey Zinc Company, Newark, N. J., for Zinc Paints.

Sandord, Charles, New York, for Magneto-Electric Machines, for medical purposes.

JURY H.

Silver Medal.

King, D. R., Philadelphia, Pa., for Two Cases of Superior Boots and Shoes.

JURY I.

Bronze Medal.

Bianchini, Gaetano, Florence, Tuscany, Mosaic Tables of Pietra Dura.

JURY J.

Silver Medal.

Papi, Clemente, Florence, Tuscany, for Castings in Bronze by a new process.

JURY K.

Bronze Medal.

Corlies and Co., New York, for India Rubber Boots and Shoes.

JURY L.

Bronze Medals.

Bachelard and Sons, Geneva, Switzerland, for fine Jewellery.

Barrett and Sherwood, San Francisco, California, for Superior Workmanship, equally in the Jewellery, Engraving, and Lapidary Branches.

JURY L a.

Silver Medal.

Maes, J. Crystallerie de Clichy, Paris, for Telescope and Microscope Object Glasses.

JURY M.

Bronze Medal.

Lacroix, Mathieu, Verviers, Belgium, (M. Fassin, Agent, N. Y.,) for a Mechanical Piano Forte.

From the above Lists the following Table has been compiled, showing the number of Exhibitors in each Class, for each Country, and the number of prizes respectively awarded.

Jury.	Class.	UNITED STATES.					UNITED KINGDOM.					FRANCE.					GERMANY.					ITALY.					BELGIUM.					HOLLAND.				
		Number of Exhibitors.	Silver Medals.	Bronze Medal.	Hon. Mentions.	Total Awards.	Number of Ex . bitors.	Silver Medals.	Bronze Medals.	Hon. Mentions.	Total Awards.	Number of Exhibitors.	Silver Medals.	Bronze Medals.	Hon. Mentions.	Total Awards.	Number of Exhibitors.	Silver Medals.	Bronze Medals.	Hon. Mentions.	Total Awards.	Number of Exhibitors.	Silver Medals.	Bronze Medals.	Hon. Mentions.	Total Awards.	Number of Exhibitors.	Silver Medals.	Bronze Medals.	Hon. Mentions.	Total Awards.	Number of Exhibitors.	Silver Medals.	Bronze Medals.	Hon. Mentions.	Total Awards.
A	1	267	2	12	71	85	13	1	....	....	1	1	....	....	....	....	6	3	....	....	3	2	....	....	1	1	....	....	....	....	....	....	....	....	....	....
B	{2, 4, and parts of 10, 18, 24, 25}	312	4	30	43	77	46	1	7	....	8	35	1	6	16	23	61	1	12	31	44	23	1	1	6	8	4	....	....	3	3	32	....	6	8	14
C	9	111	3	49	55	107	9	....	2	1	3	4	....	....	2	2	3	....	1	4	5	2	....	....	2	2	1	....	1	....	1	2	....	....	1	1
Sub C	3	97	2	22	30	54	12	....	5	4	9	22	....	6	...	6	15	....	1	2	3	9	....	4	....	4	1	....	....	1	1	....	....	....	....	....
Sub	Flour, &c.	....	2	2	17	21	....	....	....	....	....	....	....	....	....	....	....	....	2	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
D	5, 6, 7	433	25	66	....	91	15	....	2	....	2	....	....	1	....	1	6	....	1	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Sub	5	25	....	5	5	10	....	....	....	....	....	2	1	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4	....	....	1	1
E	8	71	4	10	12	26	22	....	6	1	7	5	....	2	....	2	9	....	3	1	4	....	....	....	....	....	4	....	1	1	2	....	....	1	1	2
F	Part of 10, 10*a*, 10*b*	182	6	43	41	90	22	....	10	7	17	27	2	6	4	12	37	....	3	3	6	5	....	....	1	1	....	....	....	....	....	....	....	....	....	....
G	11,12,13,14, & 15	83	1	43	....	44	60	....	32	....	32	47	....	31	....	31	112	....	50	....	50	13	....	10	....	10	10	....	4	....	4	19	....	6	....	6
H	16, 20	151	6	31	18	55	22	....	7	2	9	59	2	21	6	29	57	....	14	3	17	8	....	2	2	4	7	....	3	....	3	6	....	....	2	2
I	Part of 19, 26	158	2	22	68	92	50	1	10	24	35	34	1	14	13	28	56	....	3	25	28	29	....	7	17	24	5	....	....	1	1	13	....	1	4	5
IA	Part of 19, 20	150	....	49	6	55	44	....	17	3	20	34	....	14	....	14	55	....	13	2	15	9	....	1	....	1	7	....	3	....	3	....	....	....	....	....
Sub	....	....	2	15	3	20	....	....	4	....	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
J	21, 22	143	7	24	39	70	58	1	12	....	13	28	2	1	8	11	72	....	7	6	13	....	....	....	....	....	....	....	....	....	....	8	....	....	2	2
K	28, 29	170	2	35	50	87	38	....	10	7	17	33	....	13	10	23	107	....	5	26	31	18	....	11	....	11	....	....	....	....	....	12	....	....	4	4
L	Part of 23	48	9	8	20	37	17	4	6	3	13	30	5	1	1	7	11	1	8	5	14	14	....	7	2	9	....	....	....	....	....	4	1	2	....	3
LA	Parts of 24 & 25	25	3	9	5	17	29	1	13	8	22	21	....	10	5	15	22	....	10	10	20	3	....	1	2	3	....	....	....	....	....	3	....	1	1	2
M	30	....	....	24	7	31	....	....	3	....	3	....	2	3	....	5	....	....	5	1	6	....	....	1	....	1	....	....	....	....	....	....	....	....	....	....
Sub	Billiard Tables	....	....	2	1	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
N	17	108	4	11	21	36	44	1	4	5	10	47	....	2	3	5	46	....	1	2	3	19	....	....	1	1	....	....	....	....	....	12	....	....	1	1
O	31 & part of 23	101	1	....	5	6	65	....	....	4	4	22	1	6	10	17	22	1	....	3	4	87	....	2	4	6	7	....	....	3	3	....	....	....	....	....
TOTAL	....	2640	85	512	517	1114	566	10	150	69	229	451	17	137	78	282	697	6	139	124	269	241	1	47	38	86	46	...	12	9	21	115	1	17	25	43

JURY.	CLASS.	SWITZERLAND.					RUSSIA.					SWEDEN & NORWAY. DENMARK.					WEST INDIES, BRITISH GUIANA, &c.					BRITISH NORTH AMERICA.					HAYTI.					CUBA.				
		Number of Exhibitors.	Silver Medals.	Bronze Medals.	Hon. Mentions.	Total Awards.	Number of Exhibitors.	Silver Medals.	Bronze Medals.	Hon. Mentions.	Total Awards.	Number of Exhibitors.	Silver Medals.	Bronze Medals.	Hon. Mentions.	Total Awards.	Number of Exhibitors.	Silver Medals.	Bronze Medals.	Hon. Mentions.	Total Awards.	Number of Exhibitors.	Silver Medals.	Bronze Medals.	Hon. Mentions.	Total Awards.	Number of Exhibitors.	Silver Medals.	Bronze Medals.	Hon. Mentions.	Total Awards.	Number of Exhibitors.	Silver Medals.	Bronze Medals.	Hon. Mentions.	Total Awards.
A	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
B	2, 4, and parts of 10, 18, 24, 25	....	....	....	....	....	....	....	....	2	2	2	....	1	1	2	51	....	3	1	4	11	....	....	1	1	5	....	1	....	1	....	....	....	....	....
C	9	....	....	....	....	....	....	....	1	....	1	....	....	....	....	....	....	....	....	....	....	5	....	....	3	3	....	....	....	....	....	....	....	....	....	....
Sub C	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	26	....	2	18	20	6	....	1	....	1	4	....	1	....	1
Sub	Flour, &c.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
D	5, 6, 7	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Sub	5	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	....	1	....	1	....	....	....	....	....	....	....	....	....	....
E	8	....	....	....	....	....	....	....	....	1	1	....	....	1	....	1	....	....	....	....	....	1	....	1	....	1	....	....	....	....	....	....	....	....	....	....
F	Part of 10, 10*a*, 10*b*	41	....	5	12	17	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	1	1	....	....	....	....	....	....	....	....	....	....
G	11,12,13,14, & 15	7	....	6	....	6	....	....	1	....	1	....	....	....	....	....	....	....	....	....	....	28	....	1	....	1	....	....	....	....	....	....	....	....	....	....
H	16, 20	3	....	1	....	1	....	....	....	....	....	....	....	....	1	1	....	....	....	....	....	38	....	2	....	2	....	....	....	....	....	....	....	....	....	....
I	Part of 19, 26	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	1	1	11	....	....	3	3	....	....	....	....	....	....	....	....	....	....
IA	Part of 19, 20	13	....	3	3	6	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	30	....	8	2	10	....	....	....	....	....	....	....	....	....	....
Sub	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
J	21, 22	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	7	....	....	2	2	....	....	....	....	....	....	....	....	....	....
K	28, 29	12	....	10	....	10	....	....	....	....	....	4	....	....	2	2	16	....	....	4	4	11	....	1	5	6	....	....	....	....	....	....	....	....	....	....
L	Part of 23	12	....	3	4	7	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
LA	Parts of 24 & 25	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	....	1	1	2	....	....	....	....	....	....	....	....	....	....
M	30	....	....	1	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	1	....	....	....	....	....	....	....	....	....	....
Sub	Billiard Tables	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
N	17	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
O	31 & part of 23	....	....	....	....	....	....	....	....	....	....	2	....	....	2	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
TOTAL	....	88	–	29	19	48	....	....	2	3	5	8	....	2	6	9	69	....	3	6	9	174	....	18	36	54	11	....	2	....	2	4	....	1	....	1

The foregoing forms a summary of the origin and constitution of the American Exhibition of the Industry of All Nations, and I have now only to repeat that my early and sudden recall to England before even the general arrangements of the Exhibition were complete, made it necessary for me to seek assistance, so far as Classes 8 and 10 were concerned, and which, I am happy to say, was obligingly given by Mr. W. Antrobus Holwell, the Commissioner from Canada, whose report I have now the pleasure to append:—

NOTES on some of the Contributions to the *Exhibition of the Industry of All Nations at New York*, in 1853.

By W. ANTROBUS HOLWELL,

ORDNANCE STORE KEEPER, QUEBEC, AND COMMISSIONER FROM CANADA.

CLASS 8.—*Naval Architecture, Military Engineering, Ordnance, Armour, and Accoutrements, &c.*

CLASSIFIED LIST OF SUBJECTS FOR THE EXAMINATION OF JURIES.

CLASS 8—JURY E.

A—Illustrations by models of Shipbuilding for purposes of Commerce.

B—Illustrations by models of Shipbuilding for purposes of War.

C—Illustrations by models of Shipbuilding for the application of Steam or other Powers.

D—Vessels used for Amusement, and small Vessels generally.

E—Rigging, Anchors, Windlasses, Capstans, Sheathing, and Articles connected with practical Seamanship, and the Saving of Life from Shipwreck.

F—Infantry Army Clothing and Accoutrements.

G—Cavalry Army Clothing and Accoutrements.

H—Camp Equipage, such as Marquees, &c.

I—Naval Gunnery and Weapons of Attack and Defence, more especially adapted to Naval purposes.

J—Artillery Equipments, both in the Garrison and the Field, Machines for Mounting and Dismounting Ordnance.

K—Ordnance and Projectiles.

L—Small Arms.

M—Military Engineering, Field Equipments, Methods of passing Rivers, and other obstacles, the attack and defence of Fortresses and Field Fortification.

N—Rifles, Fowling Pieces, &c., with all their appurtenances, for Sporting purposes.

A. *Models of Shipbuilding for purposes of Commerce.*

UNITED STATES OF AMERICA.

No. 16. *Model of a Ship's Hull.* R. Underhill, shipbuilder, New York.—This is a model of the clipper ship "Whirlwind," whose length is 200 feet, breadth of beam 40 feet, and depth 20 feet. She is furnished with what are styled "steamboat-ends," which are longer and sharper than those of the ordinary build of sailing vessels; for *speed* this model promises all that can be desired.

No. 27. *Two Models of Clipper Ships.* J. Gran, designer and manufacturer, Boston.—The appearance of these models is highly creditable, but no information could be obtained as to the actual admeasurement, capacity, displacement, &c. of the vessels which they represent.

No. 33. *Model of a Clipper Ship.* W. A. Lillie, shipbuilder, New York.—The designer of this model claims to have discovered some new data for the laying down of under-water lines; but although of very fair mould, there does not appear to be any peculiar novelty in its construction.

No. 34. *Model of a Clipper Ship* (the "N. B. Palmer"). By J. A. Westervelt & Co. (erroneously entered in the Catalogue as D. D. Westervelt), showing the arrangement of beams, hatches, &c.—This is an elaborate and beautiful piece of workmanship, and worthy of the highest commendation, as affording a complete miniature representation (and therefore the means of an interesting and instructive study) of the whole framing, bracing, &c., of a vessel of this description.

No. 71. *Model of a Clipper Ship.* A. Dekke, designer and manufacturer, Boston.—The "Vision," of which this is a model, is 150 feet long, breadth of beam 32 feet, 4 inches, depth 20 feet, measurement 750 tons; though the lower water-lines of this model appear to be somewhat too full, she is, in other respects, a very promising craft.

NEWFOUNDLAND.

No. 1. *Model of a Ship's Hull.* R. Kearney, designer, St. John's.—This model, designed and constructed by a working shipwright, is of fair proportions and superior finish, and seems to combine the essentials of a capacious sea-worthy boat, with that of a tolerably fast sailer.

It is much to be regretted that this is the only specimen of naval architecture contributed by the North American Colonies of Great Britain; it being well known that very superior vessels are constructed in British North America, and especially in Canada and New Brunswick.

B. *Models of Shipbuilding for the purposes of War.*

UNITED STATES OF AMERICA.

No. 13. *Man of War Cutter, entirely of Copper,* 31 feet long. Francis' Metallic Life Boat Company, New York.—This, though entered as above (and of the ordinary mould), partakes also of the nature of those life-boats for which the owners for this patent are so justly celebrated (upwards of 2,500 of such boats having been manufactured); it is of corrugated copper, the sheets being formed in a hydraulic press by suitable dies, which at the same time that they give them their proper mould, also gather them into a series of parallel plaits or angular corrugations which give them in part the form and appearance of the outside of an ordinary "clinker built" bottom. This boat has also air tanks at either end, similar to those applied to the Francis' Metallic Life-Boat. The extraordinary degree of strength imparted to the metal of which these boats are constructed (galvanized iron being more generally used, as being cheaper than copper, though somewhat inferior) by its corrugations, in the manner practised, is strikingly exemplified by two pieces of the same copper as that of which the boat is made, placed alongside of it. One of these is a flat sheet, and bends of course with its own weight when supported merely at the ends. The other, being corrugated, and sustained in like manner by its two extremities, supports a number of heavy weights (amounting to about 1,200 lbs.) without sensible flexure.

No. 32. *Model of a Sloop of War of twenty-two Guns.* Bartlett, designer, Greenpoint, New York.—This model is highly finished, but does not appear to possess any remarkable feature of novelty or excellence.

No. 44. *Model of Clipper Corvette, with Miniature Armament.* W. Colin, designer, New York.—Seems to be well adapted to the purpose for which it has been designed.

GREAT BRITAIN AND IRELAND.

No. 15. *Model of a British Frigate.* Made by R. Urie, journeyman painter, Greenock.—Creditably got up, but presents no peculiar feature of novelty or excellence.

C. *Models of Shipbuilding for the Application of Steam or other Powers.*

UNITED STATES OF AMERICA.

No. 48. *Half Model of the Steamer "Leviathan."* D. Davison, designer, New York.—This vessel has false bows and stern projecting 100 feet from the main body of the hull, (which might probably be of some service to her if she were intended to sail "*under water*"; her builder "calculates" that she will cross the Atlantic in five days ("or a *leetle* less"). Her dimensions are, length of deck 700 feet, length of keel 500 feet, breadth 80 feet, depth 60 feet; she is to be propelled by no less than sixteen engines, of what power could not be ascertained.

No. 50. *Half Models of Steam Ships "Illinois" and "Georgia."* Smith and Dimon, builders, New York.—The midships' section of the former is somewhat abaft the middle of her length; and, as well as the "Georgia," she is fuller in the after body than the general build of American bottoms.

Nos. 41, 49, 54, 67, and 69. *Models and Half Models of Steamers.*—All present a generally favourable appearance, but do not seem to call for any especial notice.

A Model of a War Steamer, by Delano, United States, naval constructor (not in the Catalogue), is highly approved by competent judges, as comprising all the requisite elements of buoyancy, stability, and speed, with ample accommodation for stores, crew, &c.

FRANCE.

No. 5. *Model of a Steamboat.* A. Faulon, designer, Paris.—The sides are hollowed out so as to admit the inner half of a small horizontal paddle-wheel, the outer half of which projects beyond the hull into the water, and is *intended* to be there applied to the propulsion of the vessel, as though the paddle-box and wheel of an ordinary steamer were turned inwards at an angle of 90° from their vertical position, and entirely submerged; the idea, if not a very brilliant one, is at least *original.*

D. *Vessels used for Amusement, and Small Vessels generally.*

UNITED STATES OF AMERICA.

No. 7. *Lap-work Row Boat of Cedar and Oak,* varnished and copper fastened. C. L. Ingersoll, manufacturer, New York.—This is a beautiful specimen of the celebrated "Whitehall boats," and does great credit to her builder.

No. 8. *Model of a full rigged Fancy Yacht.* E. T. Darling, builder, Long Island.—Neatly made and finished, but not otherwise remarkable.

No. 22. *Model of a Sea Yacht.* F. S. Coply, designer and manufacturer, Brooklyn, New York.—This vessel is furnished with a double keel (or with two keels placed side by side with a semicircular groove, or channel, between them), and has broad projecting or "flaring" sides above the main body of the hull; her midships' section presenting on each side a sort of double ogee, with a deep-arched space (forming the double keel) between them.

No. 35. *Model of the Pilot Boat "Enchantress."* D. D. Westerveldt, shipbuilder, New York.—A beautiful combination of all the chief requisites for a craft of that description.

An exquisite Model of the famed Yacht "America," (by George Steers) is also on exhibition, though not in the Catalogue.

CANADA.

No. 1. *A Voyageur's Bark Canoe.* The Honourable Hudson Bay Company, proprietors, Suchino, Canada East.—This light frail vessel is 18 feet long, and formed of a single piece of the bark of the canoe birch tree (Betula Papyrifera); it proved an object of peculiar attraction in the Canadian Department of the Exhibition, and is of interest, chiefly as exemplifying the means devised by the aborigines, and since adopted by their white brethren, for navigating the rapid streams and extensive (and often tempestuous) lakes of Canada and the "far West." The extreme lightness of these graceful vessels enabling their navigators not only to paddle them in safety over shoals and in storms, where and when no other description of open boat could pass or live; but also to carry them bodily across the numerous "portages," or land trips, necessary to proceed from one river or lake to another, or to avoid the impracticable rapids which so frequently occur in the rivers of North America.

E. *Rigging Anchors, Windlasses, Capstans, Sheathing, and Articles connected with Practical Seamanship, and the saving of Life from Shipwreck.*

UNITED STATES OF AMERICA.

No. 6. *Nautical Life Bucket and Stool combined.* W. R. Harding, proprietor, New York.—This article (invented by a Mr. Thompson), although somewhat heavy for ordinary use as a bucket, is nevertheless an ingenious and useful invention; it consists of two concentric tin cases, the outer and larger one cylindrical, the inner and smaller one conical, thus forming a double case, with an intervening space (of about three quarters of an inch above and about two inches below) which is filled with cork; the whole being neatly joined and painted. It is furnished with holding cords (which serve also as handles for the bucket), and is said to be sufficiently buoyant to float "a *dead* weight of 20 lbs., or a *live* weight of 400!" so that two ordinary persons by clinging to it might be saved from drowning; it forms, therefore, an effective life-preserver, a water-bucket, and (being reversed) a convenient deck-stool.

No. 15. *Improved Life Boat of Galvanized Iron, with end and side Air Chambers and Self-acting Bailing Valves.* L. Raymond, patentee and manufacturer, New York.—The object of the self-bailing valves in this boat appears to be to enable her, when accidentally filled with water (as by the shipping of a sea) to rise, by the superior buoyancy of her air chambers. The valves, which open *outwards,* allowing a *portion* of the water within the boat to flow out, until the weight of the boat with its load and the *remaining* water is just sufficient to counterbalance the buoyancy of the air chambers. The boat is well and strongly built, and (apart from any peculiarity of construction) does credit to Mr. Raymond's skill.

No. 26. *Brass Wheel Blocks, &c., &c.* C. B. Timpson, manufacturer, New York.—Very creditably got up, but not possessing any remarkable features of novelty or interest.

No. 30. *Patent Ships' Blocks.* J. P. Bonnell, manufacturer, New York.—These blocks are all " strapped," or bound, with iron, round the *outside* of the block; they are very well made, but the principle on which they are constructed does not appear to differ materially from that of those in ordinary use, and is considered inferior to the one referred to subsequently at No. 68.

No. 37. *Patent Horizontal Top-sail and Seam Canvass for Sails, &c.* J. Maull, patentee and manufacturer, Philadelphia.—The material, shape, and finish of these sails are considered very creditable.

No. 40. *Patent Ships' Ventilator.* W. Robinson, patentee and manufacturer, New Haven, Connecticut.—This ventilator is of cast iron, and appears to be a substantial, effective, and simple contrivance. It has been adopted (with what result could not be ascertained) on board the United States' Mail Steamer "Humboldt," and the American steamers "Franklin" and Roanoke."

No. 42. *Steering Wheel for Ships.*—N. F. Edson, New Orleans, Louisiana.—The peculiar method of staying the wheel is ingenious, but seems liable to be injured by sudden concussion.

No. 47. *Life Preservers.* Corbiere and Tucker, New York.—These preservers are made of canvass (or other suitable material) filled with cork cuttings; they are formed in pairs, and fit under the armpits, with a couple of strings to fasten in front. They are a simple contrivance, and are considered safer and more reliable than those in which the buoyancy depends on air chambers, whether of tin, of caoutchouc, or of other substance, which are at all times liable to injury and loss of buoyancy. The price of these preservers is also very moderate, $1 each by retail, with a liberal deduction when taken in quantity.

No. 64. *Life-preserving Stools.* G. P. Tewksbury, patentee and manufacturer, Boston, Mass.—These stools, though neatly got up, do not appear to differ materially from similar articles in common use (on board of steamboats, &c.). As their floating power consists in air chambers formed of tin, they are, of course, very liable to be rendered ineffective at the very time of their being wanted as life preservers; nevertheless they are worthy of notice, as converting an article of ordinary use into the *possible* means of saving life.

No. 66. *Capstan.* J. W. Hobbs, manufacturer, Boston, Mass.—Substantially and well got up, but without any peculiar merit.

No. 68. *Ships' Blocks.* Waterman and Russell's patent; Burr, Waterman & Co., manufacturers, New York.—The principle of construction of these blocks is considered excellent. The iron bearer for the sheave pin forms also the loop, and passes through the inside of the block, where it is sunk flush with the wooden sides or cheeks; thus entirely relieving the block from strain, and, at the same time, securing the efficiency of the sheave, even should the block be injured, or entirely destroyed. The specimens exhibited are of excellent workmanship and material.

GREAT BRITAIN AND IRELAND.

No. 12. *Iron Life Boat, with buoyant expanding Fenders.* E. Denham, Jun. London.—The invention of which the above is a very small model might doubtless be found serviceable in certain cases; the fenders, however, are more likely to prove effective as buoyant than as protecting agents (excepting perhaps against high perpendicular rocks or the sides of a ship); and, it is feared, might seriously interfere with the ready management of the boat.

F. *and* G. *Army and Navy Clothing, Accoutrements, and Equipments, Armour,* &c. *&c.*

UNITED STATES OF AMERICA.

No. 24. *Full Dress Uniforms of the Officers of the United States Army and Navy; Hats, Caps, Swords, &c.* F. Derby and Co., New York.—All of ordinary material, style, and finish; two sword scabbards, however, the one of brass, elegantly embossed and gilt, and the other of black fish skin, were considered very fine; the case also contained a waterproof overcoat of vulcanized India rubber, called the "Pericles," the weight of which was stated to be only nine ounces.

No. 25. *Complete Military Equestrian Equipment for a Major-General and Colonel in the United States Army.* T. Grimsby and Co., manufacturer, St. Louis, Missouri.—

The materials used in the construction of this equipment are all of excellent quality, and the workmanship is in the highest degree creditable. The saddle (of which a bare tree is also exhibited) combines all the modern improvements, and is altogether a very superior article. The tree is patented by Mr. Grimsley, and has been extensively introduced into the American service.

No. 52. *American, British, and French National Flags*. R. S. Walker and Son, New York.—These ensigns are of good material, and well put together; they are, moreover, very tastefully and *amicably* arranged and intertwined.

No. 63. *Military Goods, parsementive, &c.* W. H. Horstmann and Sons, manufacturers, Philadelphia.—The whole of the articles in this case are beautifully got up; the gold embroidery, lace-work, ornaments and plumes, are of the richest description. The designs chaste, and the workmanship excellent. There are some sword blades and handles of exquisite finish. The *little cocked hats*, although of regulated ugliness as to shape, are of very fine material and superior make.

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Nos. 1 to 5. *Suits of Armour of the Times of Henry the Eighth* (1530), *of Elizabeth* (1590) *and* (1595), *of Charles the First* (1630), *and of Charles the Second* (1665), *with suitable Effigies*. The Honourable Board of Ordnance, proprietors.—The foregoing interesting contributions, most kindly and considerately sent over from the Tower of London to grace the New York Exhibition, have constituted one of its most attractive features. Four of these effigies have been placed at the angles of the four great divisions of the main gallery, each one (fronting towards the centre of the Building) standing on an ornamental bracket, and surmounted by a handsome canopy; their appearance in these positions is striking and effective, and adds greatly to the general *coup d'œil* of the central area, with its really beautiful dome of 100 feet span; they could not, in fact, have been better placed. The fifth effigy is placed in the east nave, near the centre of the building, slightly raised above the main floor, and in front of a portion of the articles hereafter enumerated (as No. 6).

No. 6. A *Hauberk of Chain Mail* (12th century), a *Champion* (1510) *Helmet* (1520) *Morion* with *triple Comb* (1520), *Baurginotte Helmet* (1520), *Engraved Morion* (1570), Two *Breast-plates* (the one called Musket-proof, the other with "Placcate"), and a *Casque* (1688), and a "*Grande Garde*" used over the Breast-plate (1520), also a Spanish *Wooden Stirrup*, *Gauntlett*, and a very ancient *Head Piece* (original weight, 15 lbs.)—The foregoing have also been contributed (together with several other articles to be hereafter noticed) by the Board of Ordnance; and, as might have been expected, are amongst the most attractive and interesting objects in the Exhibition.

J. *Artillery Equipments both in the Garrison and Field Machines for Mounting and Dismounting Ordnance,*

AND

K. *Ordnance and Projectiles.*

(*Mem.* These two subdivisions have been combined, in order chiefly to avoid the inconvenience of noticing separately the Guns and Carriages forming the Battery of Field Artillery.)

As might reasonably have been anticipated from the very nature of an Exhibition devoted *chiefly* to the peaceful and industrial arts, as well as from the cumbrous and heavy description of the articles themselves, there are but few specimens of Ordnance and their appurtenances exhibited, and these almost exclusively by the United States of America. These consist of—

No. 1. *Two 6-pounder Field Guns, mounted with Limber Caisson, Travelling Forge and Battery complete, with all their harness, appurtenances and contents.*

Two 12-pounder Field Guns
Two 12-pounder
Two 24-pounder } *Howitzers* } (*Dismounted.*)
Two 32-pounder

All these guns are of bronze metal (copper 90, tin 10), manufactured by the Arms Company of Chicopee, Massachusetts, for the United States Government; the casting is of the very best description, and they are highly finished and polished. There is an absence of all superfluous ornament and an appearance of stern martial beauty about them, which cannot fail to attract the notice and secure the admiration of every practised eye. A series of experiments, evincing great philosophical judgment and much mechanical ingenuity, were instituted some years back in the Naval Yard at Boston, for the purpose of ascertaining the amount of expansive force or latent pressure, exerted upon different points of the bore, between the vent and muzzle of a gun at the moment of discharge: for this purpose a series of holes were bored through the sides of a piece of ordnance along the line of its axis, each hole being at right angles thereto; each of these holes were fitted with a screw-plug capable of resisting the expansive force of the discharge. A short barrel or tube was screwed into each of these holes in succession (the screw-plug being removed for that purpose), with a steel ball or bullet (exactly fitting the tube) inserted therein; the distance to which the bullet was projected from each one of the series of holes, and with the same charge of powder in the gun, being ascertained by repeated trials carefully made, afforded a series of resulting observations, which have led to the determining with the utmost mathematical precision the exact comparative degree of strength (or of thickness of metal) which it is proper to give to the gun, at the various points in its length from breach to muzzle, so as to combine the greatest possible strength with the least compatible weight of metal. Whether the guns here exhibited have been constructed on these data, or whether the result of the experiments has ever been usefully applied (or published) could not be ascertained at the moment; but the question seems to be well worthy of consideration.

There are but twenty-four different descriptions of ordnance at present used in the land service of the United States;† of these, eight are of bronze, viz.: 6 and 12-pounder Field Guns; 12-pounder Mountain; and 12, 24, and 32-pounder Field Howitzers; and 16 inch stone, and 24-pounder Coehorn Mortars. The other 16 are of iron, viz.:

12, 18, and 24-pounder Siege and Garrison Guns.
32 and 42-pounder Sea-coast Guns.
8 inch and 24-pounder Siege and Garrison Howitzers.
8 and 10 inch Sea-coast Howitzers.
8 and 10 inch Columbiads.
8 and 10 inch light, and 10 and 13 inch heavy Mortars.
And 24-pounder Eprouvette Mortars.
(A 12 inch Columbiad has also been cast of iron for trial.)

The principal dimensions and weights of the Guns, &c. on Exhibition are as follows:

	Field Guns.		Field Howitzers.			Mountain Howitzers.
	12 Pdr.	6 Pdr.	32 Pdr.	24 Pdr.	12 Pdr.	12 Pdr.
Whole length of the piece .. .. Inches	85·	65·6	82·	71·2	58·6	37·21
Length of bore (exclusive of chamber in howitzer)	74·	57·5	64·	56·25	46·25	28·16
Diameter of bore	4·62	3·67	6·4	5·82	4·62	4·62
Length of chamber	..	..	7·	4·75	4·25	2·75
Diameter of ditto	..	..	4·62	4·62	3·67	3·34
Diameter of base ring	13·	10·3	13·8	13·8	12·	10·
Diameter of swell of muzzle	10·34	8·25	11·2	9·75	8·2	6·9
Length of trunnions	3·5	2·8	3·5	3·25	2·8	2·25
Diameter of ditto	4·62	3·67	4·62	4·2	3·67	2·7
Weight of the piece .. .. .. lbs.	1,757	884	1,920	1,318	788	220

The diameter of the vents of all pieces is 0·2th of an inch, excepting that of the Eprouvette mortar, which is one-tenth. The vents of all brass pieces are bouched with vent pieces of wrought copper screwed into the piece.

† *Mem.* Of the numbers of different kind of ordnance used in the land service of other countries, viz.:

	Brass.	*Iron.*
Great Britain	24	32
France	19	6
Belgium	7	10
Austria	15	7
Prussia	15	11
Russia	13	15
Sweden	..	11

Attached to one of the 6-pounder field guns is a simple and effective purcussion lock, the invention of Mr. Hidden of New York (patentee); the seat is of brass, and is attached to the left side of the vent; for guns that have lock-pieces, it has a flange to fit the side of the lock-piece, to which it is fastened by two bolts with thumb-nuts; if the gun has no lock-piece, the seat of the lock is attached to it by a couple of steady pins and one screw pin. There is a small brass roller at the back of the seat for the lanyard to pass round and under. The hammer is of brass, and has a cone of hardened steel screwed and riveted into the head; the hole for the pin on which the hammer turns is elongated, so that the hammer in descending, when pulled by the lanyard, is also drawn backward, thus causing it to strike the primer with increased force. The lanyard is a quarter of an inch thick, and six feet long, one end being secured by a knot to the shank of the hammer, whilst the other is fasted to an iron "toggle," which serves for a handle, and also for a wrench to turn the screw pin by which the lock is fastened to the gun.

A "friction primer" for cannon is also used in the American service, and as it appears to possess some advantages over the ordinary percussion priming (principally in not requiring any lock for its discharge); a description of it is here inserted.

It consists of a tube of brass, to the top of which is fastened a cup containing the friction powder (composed of equal parts of chlorate of potash and sulphurate of antimony, moistened with alcohol, and mixed together), four grains of which, in a moist state, are spread in the cup, and a brass slider is then placed over it, the ends of the cup folded over the slider and pressed firmly down; the upper side of the cup and the under side of the slider are roughened, and the latter has a small eye at one end, for the purpose of receiving a hook fastened to a piece of cord, about 12 feet in length, with a wooden "toggle," or handle, at the other end. The tube is filled in the ordinary way with mealed powder paste, and the whole is covered over with a varnish of shellac. It is said, that *when dry* not more than one in a hundred of these primers will miss fire; and that, if damaged by moisture, they are rendered serviceable again by drying them.

As the Tangent Scale used in the American service differs from that in general use, the following description of it, extracted from the "American Ordnance Manual, 1850 (page 112)," may not be without interest:

Pendulum Hausse or Tangent Scale.

The scale is of sheet brass (No. 13). At the lower end is a brass ball filled with lead: the slider is of thin brass, and is retained in any desired position by means of a set screw with milled head. The scale is passed through a slit in a piece of steel, with which it is connected by a brass screw forming a pivot on which the scale can vibrate laterally; this slit is made long enough to allow the scale to take a vertical position in any ordinary cases of inequality of the ground on which the wheels of the carriage may stand. The ends of the piece of steel form two journals, by means of which the scale is supported on the seat attached to the gun, and is at liberty to vibrate in the direction of the axis of the piece.

The seat is of iron, and is fastened to the base of the breach by three screws, in such a manner that the centres of the two journal notches shall be at a distance from the axis equal to the radius of the base ring.

A muzzle sight of iron is screwed into the swell of the muzzle of guns, or into the middle of the muzzle ring of howitzers. The height of this sight is equal to the dispart of the piece, so that a line from the top of the muzzle sight to the pivot of the tangent scale, is parallel to the axis of the piece; consequently the vertical plane of sight passing through the centre line of the scale and the top of the muzzle sight, will be also parallel to the axis in any position of the piece. The tangent scale will, therefore, always indicate correctly the angle which the plane of sight makes with the axis.

The seat for suspending the hausse on the gun adapted to each piece according to the varying inclination of the base of the breach to the axis. The hausse, the seat, and the muzzle sight are marked for the kind of gun to which they belong. The hausse, when not in use, is carried in a leather pouch, suspended to a shoulder-strap.

The gradations on the scale are the tangents of each quarter of a degree to a radius equal to the distance between the muzzle sight and the centre of the journal notches, which, are, in all cases, one inch in rear of the base ring.

Tangent Scales for Pendulum Hausses for Field Guns and Howitzers.

	For Guns.		For Howitzers.			
	6-Pdr.	12 Pdr.	12 Pdr.	24 Pdr.	32 Pdr.	
	Inch.	Inch.	Inch.	Inch.	Inch.	
Radius of Base Ring ..	5·15	6·5	5·	6·	6·9	
„ Dispart	1·025	1·33	0·9	1·125	1·3	Height of Muzzle Sight.
Tangent 1	1·042	1·349	0·931	1·138	1·310	
„ 2	2·084	2·698	1·862	2·275	2·621	
„ 3	3·124	4·046	2·792	3·412	3·933	
„ 4	4·164	5·392	3·722	4·548	5·248	
„ 5	5·203	6·737	4·650	5·683	6·566	

The carriages and wheels on exhibition are considerably lighter than those used in the British service; yet, from the judicious adaptation of the elements of strength, wherever *alone* it is most needed, as well as owing to the extreme care taken in the seasoning of the timber, and the fashioning and fitting of the several parts, there appears to be some reason for admitting the claim to *greater* strength and durability that is set up for these carriages over those of apparently stronger, but in reality only more clumsy manufacture.

The wheels are also considerably less dished than those used in the English service; the advantage of which, especially in rough or uneven ground, appears questionable. (The dish of all these wheels is 1·5 inch.)

There are but three descriptions of gun-carriages used for *Field Artillery purposes* in the service of the United States, viz., one for the 6-pounder gun and the 12-pounder howitzer; one for the 24-pounder howitzer, and one for the 12-pounder gun and the 32-pounder howitzer.

All these carriages are of precisely the same pattern, differing only in their dimensions. The bodies and frame-work are made exclusively of oak; the ammunition chests of walnut with oak bottoms.

The principal dimensions and weights of the field-carriages and limbers used in the American service are as follows:—

	6 Pounder Gun and 12 Pounder Howitzer.	24 Pounder Howitzer.	12 Pounder Gun and 32 Ponnder Howitzer.
Length of gun-carriage without wheels .. Inches	104·4	111·4	113·5
Distance between the inside of the trunnion plates	9·6	11·65	12·15
Distance of axis of trunnions in rear of axis of axle-tree (on level ground)	0·5	1·	0·8
Distance from axis of trunnions to that of axle-tree	14·65	16·2	16·6
Height of axis of trunnions above the ground	43·1	44·8	45·2
Distance between the points of contact of trail and wheels with ground line	74·4	79·8	79·8
Distance from front of wheels to end of trail	116·6	122·75	122·75
Distance of muzzle of the guns, in front of wheels	5·91	..	15·70
Ditto, ditto, in rear of wheels	1·09	..	..
Length of limber without wheels or pole	52·85	52·85	52·85
Length of limber with wheels and pole	173·08	173·08	173·08
Length of carriage limbered up	269·08	274·78	274·78
Whole length of axle-tree	78·84	78·84	78·84
Track of wheels	60·	60·	60·
Height of wheels	57·	57·	57·
Dish of finished wheel	1·5	1·5	1·5
Vertical field of fire, Above horizontal line, Gun	12°	..	13°
Vertical field of fire, Above horizontal line, Howitzer	13°	13°	12°
Vertical field of fire, Below horizontal line, Gun	8°	..	7°
Vertical field of fire, Below horizontal line, Howitzer	5°	8°	5°
Weight in lbs.			
Gun-carriage without wheels	540	736	783
Limber without wheels or ammunition chests	335	335	335
One wheel, Gun-carriage	180	196	196
One wheel, Limber	180	180	180
Gun-carriage complete without implements	900	1,128	1,175
Limber complete without implements	860	860	860

And those of Field-wagons as follows:—

DIMENSIONS.	Caisson.	Forge.	Battery Wagon.
Length .. .. Inches	125·5	130·	154·
Distance between axle-tree of carriage and limber	92·	97·8	112·93
Whole length when limbered up	274·7	279·	303·13
Height above ground	58·75	70·5	73·55
Weight in lbs.			
Carriage body without wheels	432	997	910
Limber without wheels or chest	335	335	335
One wheel	180	180	180
Carriage and limber complete without implements	1,982	2,217	2,130

There are but two descriptions of wheels for all the Field-carriages, viz.:

No. 1, which serves for the 6-pounder gun-carriage, the caisson, the forge, the battery wagon, and the limbers of all field-carriages, and No. 2, which serves for the 24-pounder howitzer, and the 12-pounder gun-carriages.

All those wheels are of the same form and diameter (57 inches), and fit on the same axletree, differing only in the dimensions of their component parts, and consequently in weight and strength. The same ammunition chests are adapted to the limber and to the caisson.

The weight of ammunition carried in each chest (including forges, primers, slow match and port fires) are as follows:

	lbs.		lbs.
For 6-pounder guns ..	390	For 12-pounder guns ..	491·90
„ 12-pounder howitzers	458·66	„ 24-pounder howitzer ..	535·72
		„ 32-pounder howitzer ..	464·64

The total weight of guns and carriages with limber, ammunition, implements and equipments (including large tarpaulin) ready for field-service, are as follows:

	6 Pdr. Gun.	12 Pdr. Gun.	12 Pdr. Hwtz.	24 Pdr. Hwtz.	32 Pdr. Hwtz.
	3,196 lbs.	4,446 lbs.	3,191 lbs.	4,020 lbs.	4,562 lbs.
No. of rounds of ammunition in each limber	50	32	39	23	15

The weight of the Caissons, with two ammunition chests, limber with ammunition chest, ammunition implements, large tarpaulin, &c., complete for service, is as follows:

	6 Pdr. Gun.	12 Pdr. Gun.	12 Pdr. Hwtz.	24 Pdr. Hwtz.	32 Pdr. Hwtz.
	3,527 lbs.	3,824 lbs.	3,800 lbs.	4,004 lbs.	3,773 lbs.
No. of rounds of ammunion in each caisson and its limber .. .	150	96	117	69	45

The travelling forge and its limber chest appeared to be furnished with every requisite for shoeing horses, repair of carriages, harness, &c., but a want of arrangement, or of "a place for everything, and everything in its place," was observable.

The total weight of tools, implements, and stores, contained in the limber chest of the forge was 480·38 lbs.

Weight of tools and stores in the forge body (exclusive of vice) 693·50 lbs.

The construction of the forge and bellows did not appear to be superior, if *equal*, to those used in the British service.

Artillery Harness.

A complete set of harness, for the 6-pounder field gun is exhibited. It is constructed of very fair black leather; the combined qualities of lightness and of strength where liable to the greatest strain, (as in traces, breeching, &c.,) appeared to be judiciously attended to. The sewing is evenly done with strong waxed thread in double stitch (about eight to the inch); the seams along the edges being at from 0·15 to 0·2 of an inch from the edge. The harness, buckles (all of which have rollers) loops, rings, and hooks, are of wrought-iron japanned black. The general construction of this harness differs somewhat from that used in the British service; the limber not having any sweep-bar, the fore-end of the pole is supported by the wheel-horses, by means of a chain connecting the harness with the pole-yoke; there are no leading bars, the traces from the leaders being attached to those of the wheel-horses. This same description of harness may also be used for the siege carriages, but as these latter are arranged for draught in the ordinary manner, common wagon harness may be used with them when requisite.

The bit is of iron *tinned*, the bars being rivetted into the cheek pieces. Bits are made of different degrees of severity as to curbing powers or leverage, and of three different widths between the cheeks, viz., 4⅞, 5 and 5¼ inches.

The total weight of a set of harness for each of the four horses are as follows:

			lbs.
Wheelers	Near	65·15	
	Off	55·9	
			121·05
Leaders .	Near	56·4	
	Off	49·4	
			105·8
Total for the four horses		lbs.	226·85

Mountain Artillery (*Light* 12-*pounder Howitzer*).

The gun-carriage for this piece may be either carried on a pack-horse, or drawn by means of a "thill" (or pair of shafts with cross bar), which is used with the same saddle that carries the pack. The stock is of oak in two pieces; the axletree of young tough hickory; the wheels of oak (with brass nave box); the ammunition-chest of poplar, and the "thill" of ash. The harness is black, and of much the same construction as that for field-carriages, with the substitution of a breast-plate and strap, with two shoulder-straps for the collar and harness. The bit is a plain bar, with two rings of iron tinned.

The following are a few of the principal dimensions and weights of this description of carriage, and of its equipment:

Dimensions.	Inches.
Length of gun-carriage without wheels	61·
Distance between inside of trunnion plates	7·
Distance of axis of trunnions in rear of axis of axletree, on level ground	2·5
Height of axis of trunnions above level ground	27·
Distance between the points of contact of wheels and trail with the ground-line	43·7
Distance from front of wheels to end of trail	71·8
Length of thill	73·
Whole length of axletree	38·25
Track of wheels	30·2
Height of wheels	38·
Dish of wheels finished	2·
Weights.	lbs.
Howitzer	220·
Gun-carriage complete with implements	295·
Gun-carriage without wheels	157·
One wheel	65·
Thill	30·
Pack-saddle and harness	44·
Bridle 3 lbs., halter 3·5 lbs.	6·5
Lashing girth and rope	3·
Ammunition chest packed	112·
Forge chest packed	115·
Smith's tool chest packed	117·
Coal sack filled with charcoal	25·
Carriage maker's tool chest A and B, 45 lbs. each	90·

Packs.

1st. The howitzer and thill, 250 lbs. 2nd. The gun-carriage with wheels and implements, 295 lbs. 3rd. Two ammunition chests with the haversack, tube pouch, fusee pouch, and tarpaulin, 238 lbs. 4th. The two forge chests, 232 lbs. 5th. The two carriage maker's tool chests, 90 lbs; with sack of coals, 25 lbs. = 815 lbs. The same description of pack saddle serves for each pack. Weight of saddle and harness comple, 53 lbs.

Note.—All the before-mentioned carriages, with their harness, equipments, and implements complete, were manufactured and prepared at the Watervliet Arsenal, and exhibited by permission of the United States Government.

Great Britain and Ireland.

No. 1. Among the highly interesting and varied collection of ancient and modern arms, armour, &c., which the Honourable Board of Ordnance have paid the Exhibition the graceful compliment of contributing may here be mentioned as belonging to this subdivision of Class 8, the following guns and models, from the Royal Military Repository at Woolwich. A 13-inch mortar, mounted upon a brass bed, with a contrivance for lifting the shell into the mortar, and loading.

Two brass guns mounted in an iron machine.

Cannon, said to have been made under the direction of Napoleon.

Model of a heavy brass gun, to screw in four pieces

A hand-mortar for throwing grenades, and to be fired from the shoulder.

Catapulta for throwing shells.

Gyn for mounting garrison guns.

Gyn for dismounting guns under cover of a parapet.

Gyn worked by winch, and fixed on trucks.

Ancient trench, triangular gyn.

Engine with seven barrels to be fired at once.

Rocket with four pinions, or pieces of thin metal plate, fixed obliquely to the sides, to supersede the necessity of a rocket-stick.

An engine for firing a rocket and a pistol at the same time.

A caltrop with spikes, to fold up.

A portable chevaux-de-frize, for the protection of infantry against cavalry.

A stone shot dug up within the precincts of the Tower of London.

It is greatly to be regretted that these articles, as well as the extensive collection of small arms, &c., which accompanied them, should have been placed in different parts of the building, instead of having a separate court especially assigned to them; and still more so, that from their being securely fixed with loops of copper wire, to the stands on which they are placed, it is utterly impossible to examine their construction or details.

L. *Small Arms (for Military Service.)*

UNITED STATES OF AMERICA.

No. 1. *Muskets, Musketoons,* &c., from the United States Arsenal at Springfield. *Rifles* and *Pistols* from the United States Arsenal at Harper's Ferry. *Regulation* and *Fancy Swords* from the Ames Manufacturing Company, Chicopee, Massachussetts; all the property of the United States Government, and exhibited by permission.

The following are among the principal dimensions and weights of such of the arms used in the American service as are on exhibition from *Springfield:*

DIMENSIONS AND WEIGHTS.	Musket.	Cavalry Musketoon.	Artillery Musketoon (Sword Bayonet.	Sapper's Musketoon (Sword Bayonet).	Hall's Carbine (Loading at Breech.)
Length of barrel without breech-screw .. .. .. Inches	42·	26·	26·	26·	21·
Diameter of barrel at breech (between flats)	1·25	1·25	1·25	1·25	1·
Diameter of barrel at muzzle	0·85	0·85	0·85	0·85	0·75
Diameter of bore..	0·69	0·69	0·69	0·69	0·52
Length of bayonet-blade	18·	..	18·	22·	..
Length of ramrod	41·7	25·7	25·7	25·7	19·5
Length of arm complete without bayonet	57·8	41·	41·	41·	40·
Length of arm complete with bayonet fixed	75·8	..	59·	62·1	..

A lighter musket of the *same* pattern manufactured for the use of military cadets is also exhibited.

The foregoing arms manufactured at the Springfield Arsenal are beautiful specimens of the perfection to which the machinery employed in that establishment has been carried; their appearance and finish are in the highest degree creditable, but perhaps their chief merit consists in the accurate fitting of the several component parts of each arm, and the *perfect* similarity of each of those several parts to all others of a like nature, so that every one of such parts will exactly fit *any* and *every* musket, musketoon, &c., (as the case may be), without a touch of the file, or even a tap of the hammer; a precision only to be attained by machinery of a very superior description, and the great advantages of which, especially in active service, when *time* in the repair or refitting of a piece may be of vital importance, must be perfectly obvious.

The following are the principal weights and dimensions of the rifles and pistols from the United States Arsenal at Harper's Ferry:

DIMENSIONS AND WEIGHT.	Rifle.	Pistol.
Length of barrel without breech screw .. .. .. Inches	33·	8·5
Diameter of barrel at breech (between the flats)	1·15	1·
Diameter of barrel at muzzle	0·9	0·7
Diameter of bore	0·54	0·54
Length of ramrod	33·	8·7
Length of arm complete	48·8	14·3
Weight of arm complete .. .. lbs.	9·68	2·73

They are also manufactured by machinery of the same perfect description as that employed at Springfield; and are, in every respect, good, serviceable, and well and accurately finished arms. The barrels of all American muskets, musketoons, and pistols, are left *bright*, those of rifles and carbines *only* being browned. The wood employed in the manufacture of the stocks is seasoned for at least *three* years, and kept in a *dry* place for *two* years before being worked up.

The cases used for packing these small arms are of a superior description, and seem to leave but *little* to be desired (though it is considered that there *is* room for still further improvement in this particular, in the American as well as in the British service): they are made to contain 20 percussion muskets, 20 rifles, or 50 pistols respectively. The weight of a case of each description of arms (with implements complete) being as follows:

20 Muskets, percussion		290 lbs.
20 Rifles	ditto	275 „
50 Pistols	ditto	190 „

There are about *thirty* different descriptions of *swords* (of the old and new regulation pattern) on exhibition, all the produce of the Arms Manufacturing Company, Chicopee; though there are at present but *four* patterns used in the American service, namely, the cavalry sabre, the sabre for mounted artillery, the foot artillery sword, and the infantry sword for non-commissioned officers, and (with a short blade 26 *inches*, and without guard-plate) for musicians. The sabres for cavalry officers are the same as those for the men, with the substitution of gilt for brass mountings, those for mounted officers of artillery and infantry being the same as that for the mounted artillery-men, but with gilt-mountings; and that for other officers of the line the same as the one used by the non-commissioned officers, but with ornamented gilt mountings, and a silver instead of a brass pipe, the inner half of the guard-plate being made with a hinge.

The packing-case for swords and sabres are constructed upon much the same principles as those for the muskets, &c., 30 cavalry sabres, 50 artillery sabres, 50 artillery swords, and 50 infantry swords complete a box of each kind respectively.

There are also on exhibition some very elegant and valuable presentation swords manufactured by the same Company, and among them one presented to General Taylor which cost $1000.

GREAT BRITAIN AND IRELAND.

The extensive and judiciously selected collection of ancient and modern small arms contributed by the Honourable Board of Ordnance are in the highest degree interesting, and, as before stated, well worthy of a separate "court," instead of being grouped in various places and securely fastened to their respective stands, thus serving merely as *ornaments* to the Exhibition (which they certainly do most effectually), and to heighten the effect of the really beautiful *coup d'œil* beneath the central dome of the *Crystal Palace.*

Among the ancient arms may be mentioned the following as possessing peculiar attractiveness from their presenting us with the prototypes of many of the modern improvements.

A *seven-barrelled* gun	Anno 1790, George III.
A shield with "Gonne" to *load* at the *breech*	„ 1547, Edward VI.
A five-barrelled *revolver* musket	„ 1590, Elizabeth.

Muskets with *false barrels* to contain seven charges each.

Carbine with *seven barrels* designed for the tops of ships of war.

Double-barrelled gun with pan and hammer to each of the two barrels, which *revolve*, so that one cock and flint serves for both.

A match-lock gun, the pan *opened by the trigger.*

Ancient arquebus with *rifled* barrel.

Ancient arquebus with wheel-lock, and *loading at the breech.*

French musket which *loads at the breech.*

Ancient pistol with *revolving chambers.*

This collection also contains ancient British swords, spear-heads, and axe-heads of *bronze*. An arquebuse match-lock of the time of Henry V.; wheel-lock or "dag" pistols of James I. (1610); arquebuse flint-lock and rest (1620); a wheel-lock carbine of 1685; flint-lock musket with fly bayonet of 1686; a musket with rest and mortar for throwing grenades (1686); match and flint-lock muskets of 1690; a musketoon and wall-piece with brass barrels, and a Scotch pistol with *iron* stock, of 1740; musket of 1790; cross-bows of 1520 and 1600; maces, martels, and battle-axes, of 1540; powder-flasks of 1550 and 1660; a touch-box for priming, and a set of "bandiliers," (each for a charge of powder) of the same period; a Scotch target and a spanner for wheel-locks of guns and pistols, of 1740; executioner's two-handed, broad, and various other swords of from 1490 to 1740; glaive, bilts, guisaune, spetum, boar-spear, battle-axe spear, linstock with spear, partizans and halberts of the 14th and 15th centuries; "morning star," military forks, Lochaber axe and pikeman's spear of the 16th, 17th, and 18th centuries; a spontoon, as carried by subaltern officers of the army, and discontinued in 1787; a serjeant's spear (discontinued 1831); ancient pistol with two locks; small Scotch dag-pistol (marked "Elgin"); two ancient dress swords; an ancient Scotch sword; a "pertuisan" of the household of the King of France, and pertuisan or "spontoon" of an officer of Infantry, under Louis XV.; a pike-linstock or field-staff, as formerly carried by non-commissioned officers and gunners of the English Artillery, &c., &c., &c.

Samples of each of the arms at present used in the British Army and Navy are also on exhibition (contributed by the Honourable Board of Ordnance). The following is a list of the fire-arms, shewing their principal dimensions and weight, and the respective periods at which they were introduced into the British service:—

	Introduced about	Barrel.			Bayonet.			Arm complete.		
		Length.	Weight.	Diameter of bore.	Weight.	Length of blade.	Length of handle.	Weight.	Length without bayonet.	Length with bayonet.
	Ann.	Inches.	lbs. oz.	Inches.	lbs. oz.	Inches.	Inches.	lbs. oz.	Inches.	Inches.
Musket, Foot Guards	1838									
Musket, sergeants of the Line	1842	33	3 12	·733	0 14	16½	4	8 6	49	66
Musket, rank and file of the Line	1842	39	5 0	·753	1 1	17	3½	10 0	55	72¼
Musket, Royal Artillery	1846	30	3 14	·733	1 1	17	5	8 8	46	63¼
Musket, Royal Sappers and Miners	1840	30	3 14	·733	1 12	25	6	8 8	46	72¼
Musket, sea service	1840									
Musket, rifled (for expanding balls)	1851									
Rifle, Lovell's Brunswick (2 grooves)	1840	30	4 1	·704	2 0	22	4½	9 2	46	67¾
Carbine, "Victoria," for Regular Cavalry	1840	26	3 0	·733	....	....	....	7 9	42	
Carbine, for Yeomanry Cavalry	1840									
Carbine, for Constabulary	1840									
Pistol, for Regular Cavalry	1840	9	1 6	·733	....	....	....	3 4	15¼	
Pistol, sea service	1840									

The following is a list of the Swords exhibited, with the dates of their introduction into the British Service:—

Heavy Cavalry Sword	Introduced about 1852
Light do. do.	do. do.
Infantry Staff Sergeant's Sword . .	do. 1822
Do. Sergeant's do. . . .	do. do.
Coast Guard Sword	do. 1842
Sea-service do.	do. 1850

Also a Cavalry Lance, with Colour, Strap, &c., as introduced about the year 1839.

All these are good, substantial, and well-finished arms, and in general appearance and usefulness will compare favourably with any in the Exhibition.

THE ZOLLVEREIN AND GERMANY.

No. 2. F. I. Lauer, manufacturer, Solingen, Rhenish Prussia, has some Sabres, Scimitars, Daggers, &c., of fair workmanship.

No. 9. The Widow Eickhorn and Son, manufacturers of the same place, have aso some Damascened Swords and other Side-arms of the most beautiful appearance and finish.

Dreyse and Collenbusch, of Sommerda (No. 8), exhibit some Waterproof Percussion Caps of their own manufacture, which were considered very good.

BELGIUM.

No. 1. J. Aug. Petry, manufacturer, Liege, exhibits some *Sabres* and other *Military Small Arms* of ordinary construction, but very low in price.

No. 3. Falisse and Trapman, of Liege, exhibit a very extensive and interesting collection of *Regulation Small Arms* of various Continental States and Countries, all of which, considering the exceedingly moderate prices at which they are manufactured, are of excellent quality and very fair finish. The following list of a few among them, with their respective prices (wholesale of course) may prove of some interest:—

Russian Infantry Musket	34	francs
Do. Fortress Gun	75	"
Do. Dragoon and Cadets' Carbines (two descriptions) . .	65	"
Norwegian Carbine	69	"
Schleswig-Holstein Carbine	60	"
Prussian Needle do.	75	"
Saxony do.	50	"
Do. Cavalry Musketoon	38	"
Hanseatic Towns Carbine	60	"
Belgian Civic Guard do. . . . . 68f. and	90	"
Do. Infantry Musket	40	"
Do. Artillery Musketoon	38	"
French Carbine of the "Chasseurs de Vincennes"	60	"
Do. "Thiery" Model	68	"
Spanish Infantry Musket	50	"
Do. Gendarmerie Carbines	45	"
Swiss Carbines, single and double barrelled . . 80f. 83f. and	184	"
Dutch Infantry Muskets	38	"

Bavarian Infantry Musket	41 francs
French do. do.	28 ,,
Danish Cavalry Pistol	19 ,,
Saxony Pistol (with safety-guard)	21 ,,
French do. (flint lock)	14 ,,
Also a Carbine (Rifle) with six charges (single barrel) after the American style	90 ,,

N. *Rifles, Fowling Pieces, &c., with all their appurtenances, Pistols (not intended for Military Service), &c.*

UNITED STATES OF AMERICA.

As might have been expected, the American Department is rich in this branch of the Exhibition; *most* of the articles contributed therein are exceedingly well got up, and *many* of them, independently of superiority of manufacture and finish, display great mechanical ingenuity and originality of contrivance.

No. 2. Allen and Thurber, manufacturers, of Worcester, Mass., exhibit a variety of *Fire Arms* of fair quality, but not possessed of any peculiarity of design or construction.

No. 4. *Patent Revolvers, Pistols, and Sporting Guns, with Maynard's Self-primer attached.* Massachusets Arms Company, Chicopee, Mass.—The pistols are neatly and substantially got up, and are sold at the moderate price of $10 each, (or $8 by wholesale); the guns are also of fair ordinary make and finish; the chief peculiarity in both, however, is the "Magnant" primer, which consists of a strip or ribbon of double paper inclosing the percussion powder or priming in small circular receptacles or vesicles at equal distances along its length; this ribbon is coiled up within a flat chamber fixed to the side of the lock, and furnished with a simple mechanism by which the strip is uncoiled just so much at each cocking of the hammer as to bring successively one of these vesicles immediately over the nipple or vent, where it is struck and *dispersed* at each discharge, making room for the one immediately behind it to be brought into position by the next motion of cocking. This contrivance promises to be an improvement over the old method of percussion caps, its extreme lightness being one of its chief merits; besides which, it is *said to be* perfectly waterproof.

No. 10. *Breech-loading and Self-cleaning Rifles*; *Shot, Guns, and Pistols.* Marston Fire Arms Manufacturing Company, New York.—That this is a favourite description of rifle with the Americans may be inferred from the fact, that the number of men employed in January 1853 in the manufacture of these and other similar arms and cartridges of Mr. Marston's invention was but ninety, and has been increased to upwards of a hundred and forty; the average sale being at the present date (December 1853) about forty a week. The breech-loading part of the invention consists in a sliding breech pin, which is drawn back in a line with the bore by means of a lever, the handle of which is below the butt; thus exposing a longitudinal opening in the right side of the piece immediately behind the breech end of the barrel: into this opening the cartridge is placed, when by drawing back the handle of the lever the breech pin is thrust forward, pushing before it the cartridge, which is thus lodged within the barrel; the interior and shorter end of the lever is of solid metal, and is so placed with respect to the breech pin as that when the latter is pushed wholly forward it forms with the solid end of the lever a substantial joint, the longitudinal axes of both pieces lying at an angle of about 135° to each other. Great strength in resisting the force of the discharge is claimed for this arrangement, in consequence of the combination of these two pieces of metal being *somewhat* similar to the "key-stone of an arch;" it must, however, be remembered that the whole force of the recoil is borne by the pivot on which the lever (representing the "key-stone") *turns*, there being little or no provision (in the arms examined) for relieving this pivot from the whole of this strain (though it is conceived that an arrangement for that purpose might easily be effected by strengthening the lower part of the recess in which the lever moves and causing the lever to bear against it). A small hole is bored through the sliding pin in such direction as to effect the necessary communication between the vent and the cartridge when the breech pin is pushed forward; the cartridge consists of a paper cylindrical shell cemented or tied to a small cylindrical projection at the base of the bullet, which is conical; the shell being filled with powder is closed by a disc of leather cut to fit *tightly* the bore of the piece, and pressed round its edge. A small hole is bored in the centre of this disc to admit of the necessary communication between the priming and the powder in the cartridge. At each discharge the last disc of leather *remains in the barrel* and is forced forward by the introduction of the next cartridge, and subsequently blown out by its discharge; it thus *cleans out* the barrel, which *it is said*, will in consequence be left "perfectly *bright* after a *thousand* discharges." Their price varies from $25 to $100.

No. 12. *A New Model of United States Percussion Rifle, New Breech-loading Fire Arms, Patent Revolvers.* E. Whitney, manufacturer, Whitneyville, New Haven, Connecticut.—All these arms *appeared* to be well made, but as the case containing them was locked, and no person could be found to show them, it is impossible to record their claims to originality, or other superiority of construction or contrivance.

No. 14. *Various kinds of Revolving Fire Arms.* S. Colt, manufactuurer, Hartford, Conn.—The world-wide renown of these arms render it is needless to say more respecting *this* collection than that for excellence of material and workmanship, for exquisite finish, and for elaborate ornamentation (*almost* to *excess*); as also for artistic grouping and display, the case containing them is one of the most beautiful and attractive in the whole Exhibition.

No. 31. *Improved Percussion Lock Whaling Gun and Patent Bomb-lance for killing Whales.* Tracy and Brand, manufacturers, Norwich, Connecticut.—This gun is very portable (weighing but 10 lbs.), simple and convenient; the explosive lever has pinions or "feathers" of vulcanized India rubber, which fold up around the shaft when placed in the gun, and appears to be an effective, convenient, and safe contrivance for the purpose for which it is intended.

No. 36. J. Krider of Philadelphia exhibits some well made *Guns, Rifles, and Pistols* of his own manufacture. They do not, however, appear to possess any feature of novelty.

No. 39. *New Revolving Guns and Pistols.* P. W. Porter, inventor, Memphis, Tennessee.—A solid steel cylinder or disc (2½ inches in diameter, and about ¾ths of an inch thick) has its periphery bored with eight or nine cylindrical chambers radiating towards the centre; each chamber being of just sufficient depth to receive a small cartridge with its ball. As this cylinder is made to revolve in a recess immediately behind the breech, each chamber in the cylindrical disc corresponds with the bore of the barrel, and each chamber has a perforation or channel leading from its inner or rear end to the exterior (right) face of the revolving disc, where it is covered by the cap or primer *only* when the chamber with which it communicates is in a line with and opens into the bore of the barrel; the lock moves backward on a hinge which allows it to close upon the side of the cylinder when in use, or to be opened out whenever it might be necessary to charge or exchange the cylinder; the hammer is in the *interior* of the lock which is of simple yet effective construction; the cylinder is turned round (so as to bring each chamber successively in position) by the motion of a lever (which forms also the trigger guard) downwards and forwards with the left hand; the hammer is cocked by the same movement, so that in firing all that is necessary is for the left hand to move the lever, and the right to pull the trigger. A very rapid succession of discharges may be thus obtained (as many, it is *said*, as forty in a minute, including the exchange of cylinders), an advantage which this rifle probably possesses in a higher degree than any other known contrivance.

No. 51. *Cook's Patent repeating Fire Arms.* Columbian Iron Works, Brooklyn, New York.—But one rifle of this construction was on exhibition, it being the first and only one yet manufactured; it appears to possess much original merit, and will doubtless, when finally perfected, compare favourably with any of its rivals. It consists of, 1st. A hollow stock containing a cluster of five tubes lying parallel to each other around a common centre. Each tube is of sufficient capacity to contain twelve cartridges (end to end), and is furnished with a spiral spring having a stud attached to its *lower* or posterior extremity, this stud passes through a longitudinal slit in the outer side of the tube and is received into a spiral groove formed for its reception in an *outer* case which surrounds and incloses the whole length of the bundle of five tubes; these spiral springs (one in each tube) are thus made to push against the hindermost cartridges in such manner as that at each *fifth* of a revolution of the apparatus or "magazine," containing 60 rounds, a charge is forced from *one* of the tubes in succession into the breech piece, hereafter to be described (This spiral progression of the springs within the tubes being very similar to that of the wickholder in an Argand lamp.)

2nd. Of a moveable breech piece, consisting of a solid flat cylinder or disc, with a single perforation or chamber (through its thickness and a line with one of its diameters) sufficient to contain one charge only, and a short steel rammer. This breech piece has a short jointed lever attached to it (on the left side of the stock). by means of which it is first brought into the proper position to receive a cartridge from the magazine; it is then turned round about 210°, which brings the charge in a line with the bore. The lever is then drawn backward (and outward from the piece), which moves forward the small steel rammer within the breech piece, so as to force the cartridge into the barrel, and at the same time a small blunt needle or punch in the end of the rammer, pierces a hole in the end of the cartridge; the lever is then returned to its original position (when another cartridge is forced into the chamber of the breech piece), by which movement a cap is placed upon the nipple, and the arm is ready for firing.

3rd. The primer consists of a long channel, fitted to the right side of the barrel, and capable of containing a considerable number of ordinary percussion caps, one of which is, by means of a very simple rack-work movement placed upon the nipple, at each return of the breech piece to its normal position. There is also a very simple yet effective contrivance for stripping off the exploded cap each time the hammer is raised after firing.

The working of this rifle is therefore as follows:—The magazine having been filled with its sixty rounds of ball cartridge (one of which will, of course, be in the breech piece), take the lever (which lies along the left side of the stock), turn it upwards, push forward until it comes to a full stop, when its point will lie alongside the barrel, and the cartridge in the breech piece will be in a line with the bore; draw out the lever towards yourself, by which motion the cartridge is pierced and forced into the barrel; return the lever to the side of the barrel, which returns the small rammer to its proper receptacle in the breech piece, and finally return the lever to its original position by the side of the stock, by which motion the solid part of the breech piece is opposed to the fire of the charges; a cap is placed on the nipple, and another cartridge is pressed (by means of one of the spiral springs before described) into the breech piece. The weight of this rifle complete, with its sixty rounds, is stated at from 12 to 14 lbs.

No. 59. *Corcoran's Repeating Rifle and Pistol.* (Could not be found.)

No. 60. *Sharp's Patent Primer attached to a Shot Gun.* C. Sharp, inventor and manufacturer, Hartford, Connecticut.—This is an ingenious invention, and promises to become a favourite, although from its recent origin it has not yet had the advantage of extensive trial. The percussion primers consist of very small discs or "pellets" of copper (probably not more than three-sixteenths of an inch in diameter), fifty of which are contained in a small receptacle in front of the lock and beneath the head of the hammer. These "pellets" are said to be "*air and water proof.*" The piece being cocked, the trigger is pulled, and although no indication whatever of any cap or other priming is visible, an explosion is heard each time the hammer descends, but by slowly letting down the hammer, one of these minute discs containing the priming is seen to emerge from a scarcely perceptible hole in the lock, immediately beneath the head of the hammer, being thrust out with a sort of jerk by means of a slender bolt or sliding piece, which exactly fits the slit, and which having ejected the disc immediately returns to be ready to force out another at the moment of the hammer's descent. The little disc is thus deposited, *as if by magic*, immediately over the nipple, where it is *immediately* struck by the hammer, the end of which has a slightly conical cavity for its reception, and so unerring and certain is this jerking of the disc into its proper position, that whether the piece be held with the hammer uppermost, as in the ordinary way of firing, or reversed, or with the muzzle pointing upwards or downwards, or, in short, in any conceivable position, the effect is always equally satisfactory.

Mr. Sharp also exhibits his *Breech-loading Rifle* (patented in 1850). By some accident or oversight it is not mentioned in the catalogue. This rifle may probably with safety be pronounced as, all things considered, the best breech-loading *single charge* fire-arm yet invented; and in proof that it is generally so esteemed, it may be mentioned that, since it was patented in 1850, upwards of 40,000 have been manufactured and sold; and further, that the United States Government have, upon the recommendation of a Board of Ordnance Officers, held in November, 1850, ordered a trial of them to be made by the army on active service. The Board in question, after a severe trial of this rifle, report that "it was fired several hundred times without cleaning, during which the movements of its machinery were not obstructed:" and also that "the penetration, range, and accuracy of its fire with the cartridges and conical ball prepared for it, were superior to those of any other breech-loading piece offered to the Board.

Its construction is simple. A solid breech-piece of about three-quarters of an inch in thickness, is inserted in a recess immediately behind the chamber of the barrel, so as that the faces of such breech piece shall slide against and completely close the same. This piece is drawn downwards by moving forward a jointed lever, which forms also the trigger guard; the bore of the barrel is thereby completely exposed, and may be *looked through*, thus affording great facility for observing whether it is clean or foul. The cartridge with its ball attached is then inserted by hand into the bore, and pressed home with the thumb. The lever, or trigger guard, is then brought back, which raises the breech piece, the front upper edge of which being *sharp*, cuts off the end of the cartridge so as to completely expose the powder within it to the action of the priming, which may either be the common percussion cap, "Maynard's" primer, or Mr. Sharp's own ingenious "pellet" above mentioned. The cartridge prepared expressly for this gun is provided with a conical bullet, but any description of cartridge may be used, or even loose powder, by first forcing forward the ball to the proper depth by means of a suitable rammer, and then carefully pouring over it the requisite charge of powder, any excess of which will be removed by the return of the breech piece. For safety and precision of firing and for simplicity of construction, this appears undoubtedly superior to all other breech loading single charge guns.

The prices of Mr. Sharp's Rifles are as follow:

Carbine,	Plain Octagon ..	$35
Do.	with Globe Sight	$45
Do.	Ornamented from	$60 to $100.

No. 28. Mr. R. D. Sollace, of New York, exhibits some good *Anticorrosive Percussion Caps* (United States Government style), for muskets and pistols.

No. 45. A variety of *Powder Flasks.* W. Foster, manufacturer, Newark, New Jersey.

No. 46. *Copper Powder Flasks.* J. Matthewson, manufacturer, New Haven, Connecticut. These flasks appear to be well and substantially constructed; their exterior appearance and finish are also highly creditable.

No. 62. *Shot Belts and Pouches.* Joseph F. Capewell, manufacturer, Woodbury, Connecticut.—Leather of good average quality, all well made, and neatly finished.

GREAT BRITAIN AND IRELAND.

No. 21. *Two double-barrelled Guns.* J. Manton and Son, manufacturers, London.—These guns are well finished, and do credit to the established renown of the Messrs. Manton.

No. 22. *Guns, Pistols, and Powder Flasks.* Westley Richards, manufacturer, London.—On inquiry of Messrs. F. Tomes and Co. of New York, it appears that the case exhibited by them contains one gun of very fine finish, made by Westley Richards, and one very superior double-barrelled gun (laminated steel barrel), with apparatus and case, complete, manufactured by Deane, Adams and Deane, of London. The appearance of this gun is extremely elegant, and the action of the lock particularly smooth and even.

The Guns, Pistols, and Powder-flasks imported and exhibited by Messrs. Francis Somes and Son, of New York, are of good quality, and fairly sustain the reputation of such articles of British manufacture.

No. 17. *Percussion Caps, not leaded.* Richard Walker, patentee and manufacturer, Birmingham.—These Caps are of superior quality and finish.

No. 18. *Sporting Ammunition, &c.* W. and C. Eley, importers and manufacturers, London.—All articles of excellent quality, but too well known to require further mention.

No. 20. *Percussion Caps.* S. Walker and Co., manufacturers, Birmingham.—Of good ordinary quality, but not otherwise remarkable.

Mr. Greene, of London, also exhibits some superior and highly-finished fowling-pieces and Sportsman's apparatus, as well as three Whaling Guns (*covered* percussion locks), with apparatus for whale-fishing, all of which are of excellent quality, both as regards contrivance and construction.

THE ZOLLVEREIN AND GERMANY.

No. 1. *Pistols, double-barrelled Guns and Rifles.* C. D. Tanner and Son, manufacturers, Hanover, North Germany.—Of good ordinary quality, and very moderate in price.

No. 3. *Patent double-barrelled Percussion Gun.* F. T. Thuerigen, inventor and manufacturer, Meissen, Bavaria.—Does not appear to contain any improvement in construction, though well finished.

No. 5. *Rifle Gun with German Cast-steel Barrel.* G. and W. Pistor, manufacturers, Schmalkalden, Hesse Cassel.—This Rifle, although of the ordinary percussion kind, is deserving of especial notice for superiority of finish, and for the good taste displayed in its carvings and other ornamental work.

No. 6. *Rifles and Pistols.* C. P. Crause, manufacturer, Hersberg in the Harz.—The style and workmanship of these arms are highly creditable.

No. 7. *Rifle Gun with rose-damasked Barrels.* J. V. Funk and Sons, manufacturers, Suhl, Prussia.—Finely finished, and the lock considered very superior.

No. 8. *Needle Guns,* though catalogued, not in Exhibition.

Mr. Morgenroth exhibits a pair of well-finished Pistols, not in the Catalogue.

No. 4. Hunting Percussion Caps. Klem and Foerstner, Ulm, Wurtemberg. No. 8. *Waterproof Percussion Caps.* Dreyse and Collenbusch, manufacturers, Sommerda.—These Caps appear to be of good ordinary quality, the latter being of a somewhat superior description.

BELGIUM.

No. 1. *Fowling-pieces, Pistols,* &c. J. A. Petry, manufacturer, Liège.—Of ordinary construction, but very low price.

No. 3. *Rifles, Guns, Pistols, and Percussion Caps.* Falisse and Trapmann, manufacturers, Liège.—In addition to the extensive collection of Military Small Arms exhibited by Messrs. F. and T., they have also contributed several double and single barrelled Percussion Sporting Guns and fancy Pistols of very good quality, and at equally moderate prices as those recorded under the head of "Small Arms," Class 8, L. Among them may be particularly noticed, a very ingenious single-barrelled Gun, which forms a walking-stick, the handle of which can be removed and forms a Pistol (price 34 francs); single-barrelled shot Guns at from 6 to 32 francs each; double-barrelled Fowling-pieces at from 20 to 150 francs; and Pistols of every variety (some of a superior description), for from 6 to 120 francs per pair. They also exhibit some Sporting Percussion Caps of a superior quality, neatly put up in boxes.

No. 4. *Eight Double-barrelled Guns.* J. P. L'Honneux, manufacturer, Liège.—Of good ordinary make, and very moderate prices. Some of them are creditably finished.

FRANCE.

No. 1. *Double-barrelled Shot Gun.* Houllier Blanchard, manufacturer, Paris.—The barrels of this beautiful Gun are lined throughout with platinum, the lining of each barrel being entirely wrought of a single piece without soldering or other kind of joint; the exterior of the barrel is beautifully enamelled with silver, in such wise as to render all deterioration from rust or neglect of cleaning utterly impossible. For those who could afford so expensive a luxury, this prince of Fowling-pieces would be found inestimable.

No. 4. *A pair of Pistols.* Prelat, manufacturer, Paris.—These Pistols are exquisitely and elaborately inlaid with gold, and, as well as the requisite appurtenances, are beautifully fashioned and finished.

SWITZERLAND.

No. 2. *Rifle and Appurtenances.* J. Schlaepfer, manufacturer, Glarus, Canton Glarus.—This Rifle (which was unfortunately broken at an early period of the Exhibition) is of excellent construction and beautiful finish, and is decidedly one of the best Target Rifles on exhibition.

AUSTRIA.

No. 2. *Fire-arms and Gun-hardware.* Valentine Schaschl, manufacturer, Ferlach, Carinthia.—All of very ordinary make.

No. 3. *Double-barrelled Gun and Pair of Pistols.* J. Kierner, manufacturer, Pesth, Hungary.—Of the ordinary construction, but well finished.

No. 4. *Double-barrelled Gun and Target Pistols.* F. Nowak, manufacturer, Prague, Bohemia.—Present no novelty of construction, but are exceedingly well made and chastely finished.

No. 1. *Patent Copper Percussion Caps.* Sellier and Bellot, manufacturers, Prague, Bohemia.—Of good ordinary manufacture.

CLASS 10. (Jury F.)—*Philosophical Instruments, and products resulting from their use* (e. g. *Daguerreotypes*, &c.). *Maps and Charts. Horology, Surgical Instruments and their Appliances.*

A. 1. *Astronomical, Nautical, and Surveying Instruments.*

UNITED STATES OF AMERICA.

NOS. 1 to 12. *Various Instruments and Apparatus employed in the Coast Survey of the United States.* Contributed by the branch of the Treasury Department at Washington.—These instruments consist of a *Base Line Apparatus* for geodetic triangulation; an *Astronomical Transit Instrument; Astronomical Zenith Telescope; Half-inch Theodolite* for primary triangulation; *Heliostat; Horizontal Sector* for secondary triangulation; *Plane Table* and *Metre Chain; Sextants* used in hydrography; *Steelwagen's Sounding Lead* (with specimens of soundings); *Saxton's Deep Sea Thermometer;* and *Saxton's Reflecting Pyrometer.* The base line apparatus consists of a case, or hollow elongated double cone of tin, containing the measuring bars, which are of brass and iron, and constructed generally upon the same principle of compensation as those first used in England by Major-General (then Colonel) Colby; but, as it was found that, during atmospheric changes, bars of *equal thickness* of iron and brass did not attain the same degree of temperature in the same space of time, owing to the different contracting powers and capacities for heat of those two metals, and that, consequently, a system so constructed is not *perfectly* compensating, the bars in this apparatus have been coated with a substance which causes them to absorb equal quantities of heat in the same time, and their external areas have been so proportioned to each other as to cause them, *at all times,* to attain the same temperature during the variations in that of the atmosphere. This result, at once so important and so difficult of attainment, appears to have been most satisfactorily achieved, after repeated and very careful experiments, by Professor Bache, the highly gifted and estimable Director of the United States Coast Survey operations.

The contact between the several sets of bars is effected through an agate plane and knife-edge, which are brought together by means of a "lever of contact" and level of the most perfect and delicate adjustment (similar to that employed by Bessel for standards of measure). The length of the apparatus is further corrected, before and after each operation, by comparison with a standard iron bar, by means of a Saxton's reflecting pyrometer, one of which instruments is on exhibition, and is said to denote a variation in length of the *one hundred thousandth part of an inch.* Such is the delicacy and accuracy of this apparatus, that, in a base line of seven miles it is stated that Professor Bache found that, supposing all the errors to lie in the same direction (which is in the highest degree improbable), the difference between two measurements, properly conducted, could only amount to about five-tenths of an inch.

The half inch theodolite (2½ feet) for primary triangulation, and receding to seconds, was manufactured by Simms (late Troughton and Simms) of London, and is universally considered as "a masterpiece of invention and construction."

All the rest of these instruments are exceedingly beautiful, and of the most accurate workmanship and perfect finish.

No. 44. *Achromatic Telescope, equatorially mounted in Cast Iron, with detached Tangent Screw.* H. Fitz, inventor and manufacturer, New York.—This instrument is not provided with its object glass, but is constructed for one of 4½ inches diameter, and may be used either as an equatorial or as an altitude and azimuth instrument. The arrangement and construction are good, and especially praiseworthy as enabling the student to obtain a useful instrument at a moderate cost.

No. 103. *Abbott's "Horometer,"* an apparatus for showing apparent time at sea from an altitude of the sun or of a star without logarithms. Stanley G. Trott, part proprietor, New London, Connecticut.—This instrument is constructed upon the principle of the orthographic projection of the sphere, and by it ordinary nautical problems may be worked out with facility and exactness. Although it is not intended to supersede the ordinary methods, yet to masters of merchant vessels it must be invaluable, more especially as a check in their numerical calculations, and it may even be *substituted* for them in cases of emergency. Its form is compact, consisting mainly of a plate of brass, contained within a flat wooden case; and, as it is in contemplation to construct duplicate instruments by means of electro deposition, it will no doubt be, before long, obtainable at a moderate price.

Mr. Trott also exhibits a "Geodetic Chart," which may be either used in connection with the "Horometer," or separately, in many cases. They are accompanied by a little pamphlet, describing and exemplifying their construction, uses, and advantages.

No. 173 (repeated by mistake as No. 176 in the Catalogue). *Levelling Instrument, Transit Instrument, Surveyors' Compasses.* R. H. Shea, manufacturer, New York.—These instruments, especially the levels and compasses, are well made, and creditably, though not highly finished.

GREAT BRITAIN AND IRELAND.

No. 1. *Achromatic 52 in Astronomical Telescope.* J. T. Goddard, manufacturer, Whitton, near Isleworth, Middlesex.—Not requiring particular description.

No. 20. Messrs. Gray and Keen, of Liverpool, exhibit some admirable *Marine Compasses* and *Barometers* of their own manufacture.

Messrs. Elliott and Sons, of London, exhibit an exceedingly well-made "*Dumpy*" *Level,* which is not mentioned in the Catalogue.

FRANCE.

No. 3. *A variety of Astronomical Instruments for the Navy.* F. Védy, manufacturer, Paris.—These instruments are well finished, and, considering the general superiority of their construction, are of very moderate cost. Among them may be noticed:—

A Borda's Reflecting Circle . . . . Price	400 francs
Several Sextants of from 10 to 20 centimetres radius	150 to 260 "
A Pocket Sextant, 7 centimetres radius	120 "
An Artificial Horizon, of superior workmanship . . .	90 "

THE ZOLLVEREIN AND GERMANY.

No. 36. *Observatory Apparatus for seeking Stars.* Dietrich Reimer, manufacturer, Berlin.—Of ordinary construction, but tolerably well finished.

A 2. *Mathematical Instruments.*

UNITED STATES OF AMERICA.

No. 43. *Various Mathematical Instruments.* H. Waldstein, manufacturer, New York. Of very ordinary workmanship.

No. 48. *Scales and Rules.* Ditto Ditto.

No. 88. *Mathematical Scales and Protracters in various Materials, and for all styles of Mapping and Drawing.* Finn and Baker, manufacturers, New York.—The scales are very accurately divided and highly finished. One scale, of 200 parts to the inch, is exceedingly beautiful.

No. 91. Mr. J. Prentice, of New York, exhibits a beautiful case of *Drawing Instruments,* combining all the modern improvements, all the necessary scales, protractors, &c. A complete set of colours and pencils being contained in the same case.

No. 93. *Variety of Mathematical Instruments.* Fehrens and Albrecht, manufacturers, New York.—These two cases of drawing instruments are of the most beautiful finish, and reflect great credit on the makers.

No. 95. *Elliptical Compasses.* C. F. Amsler, manufacturer, Philadelphia, Pennsylvania.—This instrument is of the ordinary construction, but well made.

GREAT BRITAIN AND IRELAND.

(Not in Catalogue.) Messrs. Elliott and Sons exhibit a case of well made and very beautifully finished *Drawing Instruments,* with colours, scales, protractors, &c. complete.

THE ZOLLVEREIN AND GERMANY.

The *Mathematical Instruments* in this Department of the Exhibition are generally of inferior workmanship.

FRANCE.

No. 5. Mr. Adrien Gavard, Engineer of Paris, exhibits a *Pentagraph of new and improved construction*, accompanied by several exceedingly minute and beautifully distinct traces (together with the originals from which they have been reduced), which satisfactorily attest the superiority of the instrument.

SWITZERLAND.

No. 27. *Mathematical Instruments in silver and brass, a Reduction Compass with Micrometer.* F. Hommel-Esser, mechanician, Aarau, Canton Argovie.—Of ordinary construction and workmanship.

No. 28. *Variety of Mathematical Instruments.* F. Gysi, manufacturer, Aarau. —These instruments are of very fine finish, and *generally* of improved construction.

No. 29. *Several Cases of Mathematical Instruments.* F. Röher, mechanician, Leutzbourg, Canton Argovie.—A very extensive collection, some of which are very creditably got up.

No. 30 *A Case of Mathematical Instruments.* J. Kern, manufacturer, Aarau.— A most complete and comprehensive set, combining every modern improvement, with the highest degree of finish, and probably altogether *the best* in the Exhibition.

A 3. *Planetariums, Globes, Maps, Charts, &c.*

UNITED STATES OF AMERICA.

Nos. 15 to 17. *Hydrographic and Plane Table Sheets, Maps, Charts,* and *Progress Sketches,* with *Reductions* from *Engraving* for the United States Coast Survey Office; and exhibited by the Coast Survey Bureau of the Treasury Department.

All these valuable contributions are, as might have been expected, in the highest style of art.

No. 26. *Planetarium of entirely new construction,* showing the actual motions of the Sun, Earth, Moon, Mercury, and Venus, and showing also the inclinations of the orbits of the Moon, Mercury, and Venus, to the plane of the ecliptic, the changes of the seasons, and other astronomical phenomena.—Thomas H. Barlow, proprietor, Lexington, Kentucky.

Although planetariums are not generally held in much esteem by *practical* astronomers, many of whom are of opinion that they are more calculated to mislead than to instruct the student of astronomy; yet, from the accuracy with which the various *motions* of the heavenly bodies are here represented, the instrument may fairly be considered as one of the most perfect of its kind that has yet been produced.

No. 27. *Riker's Manual Orrery, and other Astronomical Apparatus.* J. L. and D. J. Riker, manufacturer, New York. — Though the workmanship of these instruments is commendable, they do not seem to claim any particular notice.

No. 28. *Sixteen-Inch Terrestrial and Celestial Globes.* Charles Copley, manufacturer, Brooklyn, New York.—The delineations on these Globes are beautifully clear and distinct; they are decidedly the best in the Exhibition.

No. 86. *Globe and Sphere,* combining *Celestial and Terrestrial Globes.* G. Vale, patentee, New York.—The method adopted by Mr. Vale for combining the terrestrial globe with the armillary sphere is very ingenious.

No. 98. *Mathematics Simplified,* &c. T. Fisher, designer and manufacturer, Philadelphia, Penns.—Mr. Fisher's contributions consist, 1st. of a series of diagrams intended to facilitate the acquirement of mathematical knowledge. These figures are beautifully executed, and promise to be of benefit in assisting the student to form a clear conception of certain problems, and in demonstrating to the eye the truth of several important theorems.

2nd. Of a "dial of the seasons," showing the sun's declination at all periods of the year, with the coincident effects of light and heat upon animal and vegetable life in all climates from the equator to the poles. Beneath these are exemplified the various meteorological phenomena dependent on the effects of corresponding changes of temperature upon the ocean. The conception of this dial is clear, and its execution highly creditable.

No. 104. *Coloured Historical Chart embracing a period of* 2,400 *years.* J. Chapman, author, Brooklyn, New York.—Well conceived and creditably executed.

No. 105. *Maps of the World,* &c. &c. Thayer, Bridgeman and Fannin, New York.

No. 106. *Map of New York City.* M. Dripps, proprietor, New York.

No. 110. *Maps of the World,* &c. J. H. Colton, publisher, New York.

No. 114. *Maps of the World* and *Mitchell's Universal Atlas.* T. Cowperthwaite and Co., publishers, Philadelphia, Pen.—All of these maps appear to be carefully and accurately drawn, and the engraving is *generally* of a superior description; their merit and usefulness are, however, greatly impaired by thick coatings of gaudy colours.

No. 175. *Terrestrial Globe with Elevations of Surface to mark the Mountains; and Depressions of Surface to mark Seas, Lakes, &c., for the use of the Blind.* W. D. Cooke, designer and maker, Raleigh, North Carolina.

No. 180. *Mammoth Cosmoramic and Astronomical Globe for Colleges and Schools.* J. Mason, inventor and manufacturer, Brooklyn, New York.—These globes, although not particularly minute or distinct, are generally accurate in their delineations, and will doubtless be found valuable instruments in the hands of the teacher for imparting general information to those for whom they are specially designed.

GREAT BRITAIN AND IRELAND.

Under Class 8 (Nos. 7 to 11) have been enumerated, by mistake, the valuable collection of *Maps of England and Wales*, of *Liverpool*, of *Dublin*, of *Wigtonshire*, and of *Lancashire*, kindly contributed by the Ordnance Survey Department to enrich (as they most eminently do) this Department of the Exhibition. They will all bear (and well repay) the closest examination, and, as a matter *of course*, compare favourably with the best specimens of topographical engraving in the Building.

No. 13. *Maps, Plans, and Statistical and Geographical Illustrations.* A. Petermann, London.—All exceedingly well executed.

No. 14. *A Pair of Globes, Atlas, Maps,* &c. H. G. Collins, London.—All of these are worthy of especial commendation. The Maps are excellent, and the Atlases well arranged for educational purposes, accurately drawn and carefully engraved. Some relief Maps, especially, are extremely well executed.

No. 17. *A Block Map of Sicily*, by J. Wyld, London, does credit to its contributor.

No. 21. *Geological Maps*, by Holden, Dublin.

No. 22. *Maps of Ireland*, by Powell, Dublin.—Creditably executed, but not of a very high order of merit.

THE ZOLLVEREIN AND GERMANY.

In this Department there are some *Terrestrial Globes* (No 11), and a *Map of America* (No. 37), but neither of these contributions is deserving of particular notice.

FRANCE.

No. 4. *Topographical Drawings.* J. Cosquin, Paris.—Of ordinary execution.

No. 6. *Maps and Plans of Switzerland,* &c. T. T. Delsol, engraver, Paris.—Very finely executed.

No. 7. *Hydrographic Engravings,* &c. C. E. Collin, engraver, Paris.—Not particularly well done.

SWITZERLAND.

J. Wetter and Co. exhibit a fine *Lithographic Map of part of Switzerland,* which has been omitted in the Catalogue.

HOLLAND.

☞ No. 7. *Map and Atlas of the Netherlands.* T. Oomkens, jun., Groningen.—Well executed.

AUSTRIA.

No. 2. *Various Maps and Charts.* Franz Raffelsperger, patentee and printer, Vienna.—These Maps are very creditably got up, and, by a peculiar provision, can be made to illustrate either the physical or the political geography of the country, and in any desired language, at the option of the purchaser; they are moreover furnished at exceedingly low prices.

No. 3. *Sectional plastic* (so-called) *Maps of Switzerland.* Jacob Pauliny, designer, Vienna.—These Maps are formed in relief; they are extremely minute in their details, and beautifully finished.

No. 5. *Geometrical Models in Wood.* F. G. A. Becker, manufacturer.—These models are well made, but do not possess any peculiar merit.

ITALY.

☞ No. 1. *Topographical picture of an Alpine Valley.* E. Tirone, civil engineer, Turin, Sardinia.—Very beautifully executed.

No 2. *Terrestrial Globe*, by Grifoni, Genoa.

No. 3. *Collection of Solid Figures*, for elementary instruction in Geometry. G. Crotti, Turin.—Both of these contributions are creditably got up and well adapted to educational purposes; they do not, however, claim any especial mention.

No. 4. *Topographical Maps of the Sardinian States.*—These Maps, which are kindly contributed by the Minister of War (Turin, Sardinia,) are beautifully executed, and will bear comparison with most of the others in the Exhibition.

CANADA.

No. 1. *A large Map of the United States of America, with part of Guatemala*, &c., executed with a pen, by a lad fourteen years of age. J. Esterhart, manufacturer, Laprairie, Canada East.—This Map is an elaborate and correct copy, and reflects unusual credit on its youthful constructor.

In the Division allotted to SWEDEN AND NORWAY there is a very large *Manuscript Map* (presented by Oscar Weizerland), which is of the most exquisite finish, and far transcends in minuteness and truthfulness of detail, and in beauty of execution, anything of the kind in the Exhibition; it is, in fact, a perfect *chef d'œuvre* of topographical penmanship.

B. *Horology.*

1. *Astronomical Clocks.*

UNITED STATES OF AMERICA.

No. 102. *Astronomical Year Clock*, showing day of month, time of rising and setting of the Sun and Moon, and other astronomical phenomena. A. D. Crane, patentee and manufacturer, Newark, New Jersey.—This clock has a torsion spring regulator (*called* a "*torsion pendulum*"), and is of ingenious construction and arrangement, though of ordinary workmanship and inferior finish.

GREAT BRITAIN AND IRELAND.

No. 8. *Astronomical Clock.* C. Frodsham, manufacturer, London.—Of good workmanship and superior finish, but not otherwise remarkable.

FRANCE.

No. 24. *Clock with Astronomical Appliances.* Fouque, Sen., manufacturer, Paris.—Neatly got up, but of no particular merit.

SWITZERLAND.

No. 9. *Astronomical Timepiece.* Favre and Andrie, manufacturers, Locle, canton Neufchatel.—This clock has a new style of escapement, with a novel contrivance for compensating for heat and cold. The construction is ingenious, and the workmanship and finish very superior; unfortunately, however, it beats only *once* in *two seconds*.

[NOTE. The *Tellurians*, or *Season Machines*, in the Department of the Zollverein and Germany (No. 25), and the *Equatorial Sun Dial* (No. 1), from Holland, do not appear to claim any special notice.]

2. *Various other Clocks and Timepieces.*

UNITED STATES OF AMERICA.

No. 101. *Bronzed Clocks.* J. H. Burnett and Co., manufacturers, New York.—Exhibited only for their ornamental cases.

No. 107. *Clocks and Timepieces "of superior construction."* T. Terry, *President* of the Ausonia Clock Company (!) manufacturer, Ansonia, Connecticut.—The *official* dignity of the maker, and the *claim* to superiority of construction, are all that is remarkable or *extraordinary* in the construction.

No. 108. *Turret or Steeple Clock; variety of Timepieces, &c.* Sherry and Byram, manufacturers, Sag Harbour, New York.—Not particularly noticeable.

No. 109. *Bronze and Electro-plated Clocks.* Adolph Leconte, manufacturer, New York.—The movements offer nothing remarkable, though the cases are very creditable.

No. 111. *Eight-day and Thirty-hour Clocks.* A. S. Jerome, manufacturer, New York.—

An extensive and varied collection of the ordinary (and pretty *generally known*) description of "*Yankee clocks,*" at remarkably low prices.

No. 112. *Clocks and Timepieces of various descriptions.* H. Sperry and Co., manufacturers, New York.—This collection comprises some *Marine Clocks* of very fair workmanship; also a *Bank Clock* and *a Regulator*, both very well finished.

No. 113. *Various styles of Clocks with Brass Movements, in Papier Maché Case.* Litchfield Manufacturing Company, manufacturers, Litchfield, Connecticut.—These movements are of ordinary workmanship.

No. 179. *Variety of Ornamental Clocks.* F. Sotis, manufacturer, Forestville, Connecticut.—Same observations as at No. 109.

F. Kidder, of New York, exhibits a *Marine Clock* of superior workmanship, and probably the best of its kind in the Exhibition, though it is not to be found in the Catalogue.

Great Britain and Ireland.

No. 8. *Eight-day Clocks.* C. Frodsham, manufacturer, London.—Three mantel-piece clocks of excellent workmanship.

The Zollverein and Germany.

No. 23. *Eight-day Clocks.* G. Becker, manufacturer, Frieburg, Baden.—Of ordinary construction and workmanship.

No. 24. *Eight and Fourteen-day Clocks, &c.* C. A. Freidrich, manufacturer, Breslau, Prussia.—Same observation as the preceding.

France.

No. 1. *Clocks in Porcelain and gilded Bronze.* Lahoche, manufacturer, Paris.

No. 16. *Ornamental Clocks in Gold, Bronze, &c.* Lerolles Brothers, manufacturers, Paris.

No. 22. *Assortment of Clocks and Timepieces in Bronze, &c.* Duplan and Salles, manufacturers, Paris.—These articles are exhibited rather for the beauty of their cases and accessories (which might be noticed under Class 23) than for their movements, which do not present anything remarkable, though of good ordinary style and finish.

No. 18. *Clock with new Striking Mechanism.* J. B. de Vauvers, manufacturer· Cancale, Ile-and-Vilaine.—Mechanism *not peculiarly striking;* workmanship inferior.

No 20. *Skeleton and Alarum Clocks.* V. A. Pierret, manufacturer, Paris.—Of the ordinary construction, but well finished.

Switzerland.

No. 14. *Various Clocks.* F. E. Favre-Brand, manufacturer, Locle, Neufchatel.—Of ordinary style and finish.

Holland.

Nos. 4 and 6. Of ordinary workmanship.

3. *Marine Chronometers.*

United States of America.

No. 100. *Marine Chronometers with improved Escapement.* P. L. de Mory Greg, manufacturer, New York.—One of these chronometers (No. 555,) has a double dial and a new description of escapement. The workmanship is creditable, but the escapement is considered inferior to that in ordinary use. Instead of the usual "locking spring," a lever is substituted, the long arm of which has a fork, which acts upon a "jewel-pin," in the staff of the balance-wheel (in a manner somewhat similar to the lever of a watch); the escape pinion has two "scape wheels," one of which (the upper) gives the impetus, as in other chronometers, whilst the other alternately strikes two pallets, which serve instead of a locking spring to keep the train at rest after each impulse. It is thus evident that by this mechanism five points of friction are substituted for one. The two other chronometers (Nos. 550 and 551) exhibited by the same maker, are of very ordinary workmanship.

No. 177. *Marine Chronometers.* Kline, Samanos, and Co., manufacturers, New York.—One of these is an eight-day chronometer (No. 555) of very fair workmanship and jewelled with sapphires as far as the fuzee, the advantage of which is very questionable, as the great force of so large a mainspring as this kind of movement requires, is very liable to loosen or fracture the stone. The maker claims an improved construction and arrangement of the upper coil by the hair or balance spring and of its stud, whereby a more perfect isochronism is said to be produced; it is not, however, considered an improvement over the common method, by which perfect isochronism may be secured.

The same makers also exhibits four two-day chronometers, one of which is incomplete. They are all of ordinary workmanship.

No. 178. *Large Marine Chronometers.* T. S. Negus and Co., manufacturers, New York. —These consists of an eight-day chronometer (No. 687) and a two-day chronometer (No. 690), both of which are of very superior workmanship, and highly creditable to the makers. They are richly jewelled with rubies of great beauty, and every part of the movement from the fuzee to the escapement is finished with the greatest care and in the highest style of excellence. They are altogether the best and finest in the Exhibition.

GREAT BRITAIN AND IRELAND.

No 10. *Two Marine Chronometers.* E. D. Johnson, manufacturer, London.—It is much to be regretted that these are the only chronometers in the English Department of the Exhibition, and that, although of a fair ordinary workmanship, they are by no means a favourable specimen of the high standard of excellence to which England has attained in this branch of manufacture.

THE ZOLLVEREIN AND GERMANY.

No. 30. *Chronometer.* Menke, manufacturer, Bremen, North Germany.—Of inferior workmanship.

SWITZERLAND.

No. 4. *Marine Chronometer.* H. Grandjean, manufacturer, Locle, Neufchatel.—Of very fair workmanship, and creditably finished.

4. *Pocket Time-keepers, Watches, &c.*

UNITED STATES OF AMERICA.

No. 99. *Chronometer* and *Fine Watch.* J. R. Campbell, manufacturer, Weehawken, New Jersey.—This is a Pocket Chronometer of fine finish, made *entirely* by the Exhibitor, to whom it is highly creditable.

No. 155. *Watch.* L. Billou, manufacturer, New York.—According to the card attached to this Watch, it will run for nine days if hung up, and winds itself up if worn in the pocket; it indicates the year, month, days of the month and week, correcting itself for leap-years for 10,000 years; the mechanism is ingenious, though the works are not particularly well finished.

GREAT BRITAIN AND IRELAND.

No. 2. *Fine duplex and lever Watch Movements.* B. J. Warner, manufacturer, London. These movements are admirably finished. There are in the same case with them two lilliputian Working Models of Steam Engines, the one (high pressure construction) standing on a silver fourpenny piece, and the other a Beam Engine (low pressure) occupying a space of about 2½ by 1 inch; both are worked by means of a small air-pump concealed within the pedestal on which the case stands. The appearance of these highly-finished Philosophical Toys is beautiful, and attracted crowds of admirers.

No. 9. *Gold Chronometers, Duplex Levers, &c.* R. F. Cowderoy, manufacturer, London. These are all of superior workmanship, and decidedly the best in the English Department.

No. 10. *A Case of Watches.* E. D. Johnson, manufacturer, London.—Fair specimens of ordinary workmanship, but not remarkable for style or finish.

No. 15. *Watches of Gold and Silver,* "made in Dublin." John Donegan, manufacturer, Dublin.—Among these Watches are seven in gold cases, intended to be presented to seven Irish *Patriots* who have been exiled (for their country's good!). The cases have the Irish harp in green enamel on the back. The workmanship of all these Watches is of inferior quality.

Hunt and Roskill, of London (not in Catalogue), exhibit some *Gold Repeaters,* with duplex and lever escapements and compensation balances, all of which are of fair quality, independently of the great beauty and richness of their Cases.

SWITZERLAND.

The show of Watches in this Department is, as might have been anticipated, rich and varied, and by far the largest and most attractive in the Exhibition. They are, however, chiefly remarkable for the extreme beauty of their cases or settings (the consideration of which belongs more properly to Class 23); the movements are of the various qualities usually met with in Swiss Watches. The following, however, deserve to be particularized, as containing work of superior merit, or some other peculiarity of construction:—

No. 3. *A Pocket Chronometer*, of fine workmanship, by Mermod Brothers, St. Croix, Canton of Vaud.

No. 4. *A variety of Pocket Chronometers* and *Anchor Escapement Watches*, of fair workmanship, by H. Grandjean, of Locle, Neufchatel.

No. 5. *A very superior Anchor Escapement Watch*, with some fine *Chronometer* and other *Watches* and *Movements*, by E. and A. Paillard Brothers, manufacturers, St. Croix, Canton of Vaud.

No. 6. Among other Watches, one *Anchor Escapement* of novel construction, called the "Robbin Escapement," finely finished, by Lequin and Yersin, of Fleurier, Neufchatel.

No. 7. Some finely-finished *Chronometer Watches*, by Jules Rauss, Chaux de Fonds, Neufchatel.

No. 10. *A Pocket Chronometer* and some *Anchor Watches*, finely finished; also a Watch called a "Chronographie," having a double independent seconds hand, by means of which the time of an observation is marked upon the dial to the fraction of a second. The contrivance is simple and ingenious, and the workmanship of the whole movement extremely beautiful.

No. 12. *A Pocket Chronometer*, in gold case, with fuzee and chain "à l'Anglaise." A *Gold Independent Seconds Stop Watch*, with *Anchor Escapement*; gold and silver Watches in various styles.—All of good quality, by Brietling and Laederich, Chaux de Fonds.

No. 18. *Pocket Chronometers*, finely jewelled, by H. J. Borel, Chaux de Fonds.

No. 19. Some fine *Movements of Clocks and Watches*, by H. Bock of Locle.

No. 21. *Pocket Chronometers* and *Independent Seconds Watches* (in gold cases), of excellent workmanship and fine finish, by H. Martile, jun., Locle, Neufchatel.

No. 22. *A Pocket Chronometer* and *Independent Seconds Watch*, of good workmanship, by A. Perret, of Locle, Neufchatel.—By a curious and very ingenious contrivance, the latter can be made to indicate whole seconds, or fifths of a second, at pleasure, by merely touching a spring.

No. 40. Among a variety of Watches of fine finish, though of the ordinary style, by L. Audemars, of Brassus, Canton of Vaud, there is one which is deserving of especial notice; it is a *Pocket Chronometer*, with double-time dial, independent (split centre) seconds hand, dial with days of the week and month, thermometer, &c., besides a repeating mechanism, all very ingeniously arranged and constructed.—The workmanship of *all* these Watches is admirable, and, taken altogether, they are probably the best collection in the Exhibition.

No. 41. A case of exquisitely-mounted *Watches*, &c., by H. Capt, Geneva. The enamelling and jeweller's work upon the cases of these Watches is superior to anything else of the kind in the Exhibition; the movements are all creditably finished; two of the pieces are worthy of special mention; the one being a *Card Case* (exquisitely enamelled) which, on touching a spring, discloses six dials which show the time of day, days of the week and month, &c., &c., all by one watch movement; the other is a very small box containing an *Eight-day Chronometer*, *&c.*, and having on the top a diminutive *singing bird*, which warbles very sweetly and naturally, with swelling throat and (apparently) through its opening bill, moves its head and wings, &c., &c., all in perfect and admirable imitation of the living bull-finch, to which it bears a very close resemblance.

G. Dubois, of Switzerland, exhibits a fine gold *Anchor Watch*, not in the Catalogue.

F. X. Berbeget, of Switzerland, also exhibits some very fine gold *Repeaters*, and *Independent Seconds Watches*, which are not mentioned in the Catalogue.

5. *Miscellaneous Tools, &c.*

UNITED STATES OF AMERICA.

No. 87. "*The wonderful Pantechun or Master of various Arts.*" An absurdity unworthy of further notice.

A finely finished and well contrived *Watchmaker's Lathe*, with patent *Universal Chuck*, for turning and finishing watch pivots, pinions, staves, &c. is exhibited (together with some articles of very delicate workmanship and fine finish, executed in this lathe) by J. M. Bottum, of Bridgeport, Connecticut (under Classes 5 and 6).

SWITZERLAND.

No. 17. *Two Enamelled Watch Dials.* J. H. Racine, manufacturer, Chaux de Fonds.—These articles deserve especial notice for the beauty and delicacy of their divisions and figuring.

No. 32. *A Depthing Tool*, and *a Finishing Tool* (called, by mistake, in the Catalogue, "*A new style of Compass*"). Keigel and Petitpeirre, manufacturers, Couvet, Neufchatel.—The construction and finish of these instruments are worthy of the highest commendation.

Barometers and Thermometers.

By far the greater number of specimens of these instruments in the Exhibition are rather remarkable for the beauty of their exterior appearance than for their scientific construction or accuracy; exceptions may, however, be made in favour of those exhibited by Messrs. Adams and Tagliabue of New York (No. 49 in the American Department); of the *Chemical Thermometers* of Louis C. Hoffman of New York (No. 9 of the same Department); and of the *Barometers* exhibited by Messrs. Gray and Keene of Liverpool, England (not mentioned in the Catalogue), one of which latter has a sympiesometer attached.

None of the instruments in this subdivision appear to call for especial notice.

C. *Miscellaneous Instruments and Apparatus and their Products.*

1. *Instruments and Apparatus.*
2. *Processes and Products.*

C 1. *Miscellaneous Philosophical Instruments, &c.*

United States of America.

No. 23. *Revolving and Flashing Fresnel Light*, of the first order, manufactured by Lepaute of Paris, and imported by the United States Government for the Light House at Cape Hatteras; exhibited by permission of the Light House Board of the Treasury Department at Washington.—This superb apparatus formed one of the chief attractions of the New York Crystal Palace since it was determined to keep the Exhibition open at night; the workmanship and finish of all its parts are admirable, but the construction and details of the "Fresnel Light" are now too generally understood to require further mention.

No. 24. *Houses' Electro-Magnetic Printing Telegraph* in operation. J. B. Richards, proprietor, New York.—This beautiful and ingenious instrument is also too well known to need description.

No. 25. *Electric Telegraph Register;* various kinds of *Telegraph Insulators*. J. M. Batchelder, inventor, Boston.—This register is intended to be used in connection with Morse's Telegraph; and consists of a strip of coloured foil wound *longitudinally* round a cylinder, against which a heated iron point is pressed by the intermitting action of the battery so as to leave *indelible* lines and dots upon the foil; the cylinder has a lateral, in addition to the ordinary rotary motion, so that the line of characters traced upon the register is spiral, and consequently when the slip of foil is removed and opened out the writing may be read from left to right as with printed or manuscript papers. The arrangement appears to be an ingenious one and susceptible of extensive application.

The several insulators appear to be well adapted for all the different circumstances under which supports for the wire of a telegraph may be required.

No. 29. *Morse's Electric Telegraph Apparatus* in operation. W. M. Swain (President of Morse's Magnetic Telegraph Company), proprietor, New York, &c.—The admirable simplicity and efficiency of this instrument, and its superiority in *these respects* at least, over all others, is well known and *generally* admitted.

No. 30. *Portable Illuminator*, under the patent of the United States Gas Company. W. C. Dusenberry, manufacturer, New York.—This apparatus, which is compact and portable, is adapted to the manufacture of gas from what is termed "seconds" or resin oil; the purification of the gas is effected *within the retort*, by means of a compound (of which animal charcoal and lime are understood to form the chief ingredients) which alternately removes the impurities from the gas and discharges those impurities by the agency of *heat alone*, so that the same charge (of this compound) will last for a great length of time; for localities at a distance from gas companies, or possibly in large establishments where the consumption of gas is such as to warrant the expense of a separate gas apparatus and attendance, this invention appears to offer advantages over the ordinary appliances in such cases.

No. 31. *Self-regulating Anti-corrosive Gas Burners.* Mallerd and Napier, inventors and manufacturers, Brooklyn, New York.—This was understood to be a valuable improvement, but unfortunately the proprietor could not be found to explain it.

No. 45. *Air Pump*, and other *Pneumatic Instruments*, &c. B. Pike, jun. manufacturer, New York.—All these instruments are of the usual construction, but very creditably finished.

No. 46. *American Lever Air Pump.* Chamberlain and Ritchie, Boston.—The construction of this pump is simple and effective, the workmanship is excellent.

No. 49. *Various Glass Hydrometers; Hydrostatic Gold Test.* Adams and Tagliabue, manufacturers, New York.—All creditably got up.

No. 89. *Various Philosophical Instruments.* C. B. Warring, A. M., manufacturer, Poughkeepsie, New York.—Of ordinary workmanship.

No. 92. *Hydrostatic Instruments,* &c. L. C. Hoffman, New York.—All these instruments are of good construction and nicely finished.

No. 128. *Patent Electro-Magnetic Machines,* &c. S. B. Smith, inventor and manufacturer, New York.—The construction of these machines is simple and effective. Mr. Smith claims a new discovery in the working of a spring "on the *vibratory principle* to give out both the *direct* and the *to and fro* currents just as may be required;" the *originality* of the discovery is questionable, but the neatness and finish of Mr. Smith's instruments are praiseworthy.

No. 156. Houghton's *Electric Machine* for *Medical Purposes.* C. Sandford, manufacturer, New York.—The form of these machines is compact, and considering their moderate size the power of the shock from them is great. Their finish is creditable to the manufacturer, as their construction is to the inventor.

No. 165. Jackson's *Patent Annunciator* for Hotels. Chalmers, Manufacturer, New York.—This exceedingly ingenious and beautiful piece of mechanism may be more properly considered a "machine for direct use" than a philosophical instrument.

No. 181. *Patent Transparent Gas Meter,* &c.; *Patent Experimental Gas Meter.* J. Laidlaw, inventor and manufacturer, New York.—These meters (which scarcely belong to the class of philosophical instruments) are of good construction and finely finished.

GREAT BRITAIN AND IRELAND.

Mr. W. Ackland (No. 3) exhibits some *Hydrometers,* and an *Alkalimeter* for the purpose of illustrating a *Dividing Machine* of his own invention, and for which he is entitled to commendation.

No. 11. *Model of Croll's Dry Gas Meter.*—This model is neatly and substantially got up.

FRANCE.

In this Department Mr. Duboscq-Soleil (No. 15) has a variety of beautiful *Apparatus* (part of which are referred to under the subdivisions A, E, and F); and Messrs. Desmontis and Co. (not in the Catalogue) exhibit an extensive and valuable collection of *Chemical Stills, Crucibles,* and other *articles of Platinum, Palladium, Iridium,* &c., among which is a large *Platinum Still* (for the rectification of sulphuric acid), value at $12,000.

THE ZOLLVEREIN AND GERMANY.

No. 2. *Air Pump, Chemical Apparatus,* and various *Philosophical Instruments,* &c. J. F. Luhme and Co., manufacturers, Berlin, Prussia.—All these articles are in the well known style of excellence of these manufacturers, but do not appear to possess any peculiarity of construction or details.

There are some other exhibitors of Chemical and Pharmaceutical Apparatus in this Department, the collection of Petre and Co. of Dresden, and of Edward Gressler of Erfort (No. 32), being complete and comprehensive; but the several articles which they comprise are of the ordinary kind, and do not therefore appear to call for especial mention.

Batka Wenzel of Prague exhibits some *Chemical and Pharmaceutical Apparatus,* the chief novelty in which consists of some *Glass Retorts,* the bottoms of which are coated with copper by electro deposit. The device seems an ingenious one, and will, no doubt, be found advantageous, if not liable to objection on account of the unequal expansion of the two substances.

C. 2. *Miscellaneous Philosophical Processes or Products.*

UNITED STATES OF AMERICA.

Nos. 13 and 14. *Specimens of Electrotype Copperplates,* produced at the United States Coast Survey Office.—These plates are three in number, and consist of,—1st. The original engraved plate; 2nd. A reverse or matrix obtained therefrom by electro deposit; and 3rd. A "duplicate" or fac-simile of the first or original plate, this last being also obtained by electro deposit upon the reverse or matrix No. 2; a printed proof or impression on paper from this latter completes the collection, and affords satisfactory evidence of the perfect manner of conducting the whole operation, all the most minute points and delicate lines being brought out beautifully sharp and distinct. As the several processes adopted in the production of these plates appear to be all of the most improved description, formed on sound philosophical principles, whilst some of them are claimed as the invention of Mr. Mathiot, of the Coast Survey Electrotype Laboratory, under whose able direction the whole work is conducted, a brief description of those processes may not be unacceptable.

The original plate, as received from the engraver, is immediately electro-silvered, and then washed with an alcoholic solution of iodine and exposed to sunshine or bright light. This is found effectually to prevent the adhesion of the electro deposit to the original plate (probably by the interposition of an infinitesimal film of the *vapour* of iodine), without in the slightest degree impairing the sharpness of the impression, the thickness of the coating of iodine vapour being estimated by Mr. Mathiol at *one forty-four millionth* part of an inch: or, upon the supposition that the iodine remains upon the plate in its elementary state, thus the thickness of the deposit is estimated at "*one eighteen thousand millionth* part of an inch!"

The plate thus iodized is placed in the vat or decomposition trough in a *vertical* position (the necessary connections with the battery and other arrangements being effected, as usual), and as soon as a sufficient surface layer is produced (which usually takes about twelve hours), the plate with its surface layer is removed to another vat, in which it is placed horizontally with its face upwards, and the positive pole or plate of copper immediately over it, at a distance of about an inch,—the temperature of the copper solution in this horizontal bath being maintained uniformly day and night at about 180°. This is effected by means of a simple furnace with self-regulating damper and an internal coil or helix of pipe, with an upper and a lower tube leading to the corresponding parts of the vat or bath, in which the required temperature is thus maintained by the circulation of the fluid in the ordinary manner; it being found that a peck of charcoal will maintain 100 gallons of the copper solution at any required point between 100° and 200° for twelve hours; the result of such increase of temperature being that a plate of copper one-eighth of an inch thick, and containing 10 square feet of surface, can be produced in forty-eight hours, or at the rate of 3 lbs. to the square foot in twenty-four hours. The quality of the metal produced under such increased temperature being moreover found to be of a very superior description, rivalling in hardness, durability, and elasticity the best rolled or hammered copperplate. This is satisfactorily exemplified in a couple of broad strips of copper, one-eighth of an inch thick, which are exhibited near these plates. One of the strips is flat, and found to be exceedingly hard and sonorous; the other is twisted up into a sort of open single knot, to prove the perfect ductility and tenacity of the metal. It may also be mentioned that about 2000 impressions were printed from the first electrotype duplicate taken from the original plate in the Exhibition without its showing any appearance of deterioration, although the lines are many of them exceedingly light and delicate,—so much so, that it is said by competent judges that the original *engraved* plate would probably have failed in producing *one* thousand equally good impressions.

Mr. Mathiol manufactures or produces the negative silver plates of his batteries by electro deposition, and in order to remove from their platinized surfaces the impurities of the zinc plates, which are invariably found to attach themselves thereto, he immerses them *daily* in a solution of per-chloride of iron, which is found to immediately restore the action of the plate, and thus to constantly maintain the "*tone*" of the battery.

D. *Scales, Balances, Measures, &c.*

These contributions may be conveniently classed under two distinct heads, viz.:—1. *Delicate Balances,* including the *smaller Bullion and Gold Scales, Druggists' Scales and Chemical Balances;* and 2. *Scales for determining larger weights,* and those for *general commercial or domestic purposes.*

D 1. *Delicate Balances, &c.*

UNITED STATES OF AMERICA.

No. 20.—*State Balances* of three sizes.

No. 21. *Mint Balances of the United States.*—The foregoing with (No. 19) *Standard Measures of Capacity, Standard Weights* and *Standard Yard Measure* (of the United States), and (No. 22) *Standard Weights, Measures and Metre of France,* are contributed from the Office of Weights and Measures of the Treasury Department at Washington (U. S.). They are all of admirable construction and finish, and, as *a collection,* are superior to any other of the kind in the Exhibition.

No. 35. *Micrometro-Chemical Balance.* E. Foote, inventor and manufacturer, Jersey City, New Jersey.—The construction of this Balance appears to be simple and ingenious; the maker states that it will weigh from the 1,000th part of a grain to two ounces; it is well finished, but could not be minutely examined or tested, as the key of the case in which it was contained was not to be procured.

No. 36. *Chemical Balance and Weights of Palladium.* J. Barkenberg, manufacturer, New York.—This balance is highly finished and exceedingly delicate; the beam is supported by an agate plane, resting on an agate knife-edge, and the scales are supported in a similar manner; for small weights, this is by far the best in the Exhibition.

No. 37. *Balances for Druggists and for weighing Gold*; *Standard Weights and Measures.* J. A. Kissam, manufacturer, New York.—These articles are of the usual construction, and creditably, though not highly finished.

No. 38. *Bank Scales and Weights.* F. R. Myers and Co., Philadelphia, Pennsylvania.—For excellency of finish and delicacy of adjustment, these Scales are second only in merit to those exhibited by the Treasury Department (Nos. 20 and 21); the weights are also very beautiful.

THE ZOLLVEREIN AND GERMANY.

No. 2. Among a great variety of excellent Chemical and other Philosophical Apparatus from the celebrated manufactory of Lhume and Co., of Berlin, there are several remarkably delicate and accurate *Chemical Balances*, which are worthy of especial notice.—All the other Balances in this Department are of inferior quality.

FRANCE.

No. 2. *Patent French Balances.* Beranger and Co., manufacturers, Lyons.—These Balances, of which there are several sizes, are all of excellent workmanship, and are remarkably delicate and accurate.

HOLLAND.

No. 5. *Balances for Analytical purposes.* C. Becker, inventor and manufacturer, Arnhem.—These Scales are extremely delicate and well adapted for the purpose of quantitative analysis.

D. 2. *Scales for Heavy Weights, &c.*

UNITED STATES OF AMERICA.

No. 34. *Railroad Depôt Scale, Rolling Mill, Platform, Flour Packers' and Counter Scales.* E. and J. Fairbanks and Company, manufacturers, &c., Johnsbury, Vermont.—This is an extensive and varied collection of Balances and Scales, all of admirable form and finish, combining almost *perfect* accuracy with great strength and stability. The Railroad Depôt Scale is adapted for weighing up to twelve thousand pounds, and one of the Platform Scales up to twelve hundred. The extreme delicacy of these large Scales is surprising, and the Messrs. Fairbank and Co. claim the invention of a new mode of steadying the platform whereby greater accuracy is secured. Some idea of the degree of perfection to which these makers have brought their instruments may be formed from the two following facts, both of which are authenticated by certificates from the Franklin Institute at Philadelphia, and from the Coiner of the United States Branch Mint at New Orleans.

1. A "Weighlock" Scale, erected on the Tide Water Canal, about twelve miles south of Columbia, was tested by placing in the cradle a boat weighing 150 tons, when the weight of a *bucket of water* placed upon it was plainly and immediately indicated, and the weight of a person standing in the boat could be *accurately* ascertained.

2. A Platform Scale was constructed for the Branch Mint at New Orleans, which Scale, according to agreement, was to be capable of weighing 25,000 Troy ounces of bullion with a variation of not more than one ounce in twenty thousand. After repeated and careful trials it was found that the greatest apparent variation was no more than the *one-fifth* of an ounce in twenty thousand ounces.—An accuracy and a delicacy which appear to be as near perfection as can be attained or even *desired.*

No. 39. *Dormant Platform Scales.* J. A. Ross, manufacturer, St. Louis, Missouri.—Of creditable workmanship, but not otherwise remarkable.

No. 40. *Platform and other Scales.* New York Scale Makers' Company.—These are all of good construction and superior finish, combining strength with accuracy and delicacy.

There are several other Scales and Balances in the Exhibition, but they do not appear to possess any peculiarity of construction, nor are they of such a degree of finish as to call for particular mention.

E. *Optical Instruments, comprising*

1. *Microscopes and Miscroscopic Preparations and Objects, and*
2. *Various other Optical Instruments.*

E 1. *Microscopes and Microscopic Objects.*

UNITED STATES OF AMERICA.

The collection of microscopes in the Exhibition, and especially in the American Department, is extensive and varied; but the greater number of these instruments are of low price, and intended rather for philosophical recreation or rational amusement than for scientific research; there are some among them, however, of good construction, combining every modern improvement with the highest degree of accuracy and finish as well in the lenses as in the mountings.

The best microscopes in the Exhibition are the two contributed by Mr. C. A. Spencer of New York (not mentioned in the Catalogue). The larger of these instruments has a trunnion-mounted stand, the workmanship of which is of the most perfect finish and improved construction; the fine adjustment is effected by means of a conveniently contrived lever and screw; the stage has a universal horizontal as well as a circular motion; the instrument is also provided with achromatic condenser, polarizing apparatus, &c. &c. The stand of the smaller instrument, though of less costly construction, is well finished, and provided with every *essential* convenience for scientific investigation; it consists of a stout shaft turning on a hinge, so as to be placed at any requisite angle, the whole being substantially and handsomely put together.

The chief merit of these instruments, however, consists in the perfection of the lenses; the objectives are far superior to any others in the Exhibition, and in their powers of definition and penetration, and in the abundance of light they admit, they are believed to be quite equal to any that have ever been produced; these lenses have been constructed according to formula (worked out by Mr. Spencer himself) which have secured for them, together with every requisite correction, an angle of aperture which is said by competent judges to be much larger than has been attained by any other maker, and one which (in the higher powers at least) is not likely to be surpassed. Mr. Spencer's objectives have focal distances of from two inches to the one-twelfth of an inch, and the following table of the focal distances and angles of aperture of four of these lenses will afford some idea of their excellence:

Focal distance	½ inch	Angle of aperture	70°
Ditto	¼ "	Ditto	135°
Ditto	⅛ "	Ditto	170°
Ditto	$\frac{1}{12}$ "	Ditto	178°

No. 32. *Achromatic Microscopes, Single and Compound.* Grunow, Brothers, manufacturers, Brooklyn, New York.—This collection consists of three instruments, all of approved construction and superior finish; one of them is trunnion-mounted, its fine adjustment being within the body; the stage has a convenient horizontal (lever) motion in every direction, as well as a circular movement; it is furnished with a series of objectives from two inches to the eighth of an inch focal distance; it has also an achromatic condenser, polarizing apparatus, and a variety of eye-pieces; the objectives are of excellent quality, and the second best in the Exhibition; the brass work is of high finish, and the steadiness and uniformity of its movements are admirable.

The other two instruments exhibited by the Messrs. Grunow are of a more simple construction, and therefore better adapted to the means as well as to the requirements of the younger student; whilst, at the same time, they are so constructed as to receive any or all of the lenses that accompany the more expensive and complicated instrument. The stand of one of these microscopes is constructed in part of cast iron lackered, and its stage moves in every direction upon steel rods, the object being to combine a sufficient degree of convenience and accuracy with comparatively small cost; one of these instruments has a goniometer ingeniously combined with the micrometer eye-pieces and fitting the top of the tube.

No. 42. *Microscope.* A. Derne, manufacturer, New York.—Of good ordinary construction and creditable finish.

No. 162. *Microscopes,* &c. Dr. W. J. Burnett, Boston, Mass.—These instruments, &c. present nothing remarkable.

Great Britain and Ireland.

No. 4. *New Anatomical Microscope.* J. Davis, manufacturer, Derby, England.—Of ordinary construction, but creditably got up.

No. 7. *Achromatic Microscope.* J. Solomon, manufacturer, London.—Of good ordinary construction and well finished.

France.

No. 8. *Microscopes* on the English plan, &c. Mirand, sen., manufacturer, Paris.—All these are fine instruments, one of them is of large size, and furnished with every requisite for microscopic research; another is exceedingly compact and portable, as well as of superior intrinsic merit. The lenses are all good, and would be considered superior were they not in some degree eclipsed by their more perfect rivals in the Exhibition.

No. 13. *Microscopes* of various descriptions. Nachet, manufacturer, Paris.—These instruments are of beautiful wormanship; one of them has a trunnion mounting (somewhat upon the English plan) admitting of any desired degree of obliquity of position, with horizontal and circular stage movements; the reflector is attached to the foot of the instrument and requires a separate adjustment for every degree of obliquity; in consequence of this arrangement, and of the depth of the stage and its accessories, oblique light cannot be used for this instrument, a defect which is common to several others by the same maker, and to remedy which an oblique condenser is provided; but this can scarcely be considered as an equivalent for the variable obliquity secured by the adoption of a reflector with perfect freedom of motion; there are eight objectives with this instrument, the highest of them having a focal distance of but little over the one eighteenth of an inch. The magnifying powers of Mr. Nachet's combinations are high, whilst a large quantity of light is afforded by his condensers; great credit is therefore due to Mr. N. for the successful application of mathematical principles to the exceedingly difficult construction of lenses at once so minute and so perfect. One of these instruments is styled a "Chemical Microscope," the objective being placed *beneath* the object, so that the light is transmitted downward and the image is received upon a prism by which it is reflected through an oblique body or tube attached to the foot of the instrument; the intention of such construction being to protect the objective from the deleterious influence of gases, &c. evolved whilst studying the effects of chemical actions upon such objects as may be under investigation—a contrivance, it is said, of Professor Lawrence Smith of Louisville, Kentucky. The instrument (which is furnished with a separate set of lenses) may also be used as an ordinary microscope.

No. 14. *Microscopes*, &c. A. Lebrun, manufacturer, St. Pierre le Bitiz, Paris.—These instruments do not appear to possess any peculiar merit.

UNITED STATES OF AMERICA.

No. 67. *Microscopic Objects in Physiology and Natural History*, prepared by S. Durker, M.D., Boston, Massachusetts.—This is a complete and beautiful collection of 120 specimens of microscopic anatomical preparations, illustrative of the structure of several of the most important and minute tissues of the human body; evincing great, if not *entire* success in the exceedingly difficult art of capillary injection.

There is also in this department a series of fair specimens of *Microscopic Preparations* by capillary injections, by Messrs. Poulett and Fry (not in the Catalogue); and Dr. Alexander Murray of New York, exhibits (No. 47) a complete and interesting collection of *Microscopic Objects*, illustrative of *Comparative Anatomy*, *Botany*, *Chemistry*, *Entomology*, *Geology*, *and Zoology*.

FRANCE.

Moraine, Sen., of Paris, exhibits a few *Prepared Objects*, which are creditably put up.

E. 2. *Miscellaneous Optical Instruments.*

UNITED STATES OF AMERICA.

No. 33. *Improved Stereoscope.* O. F. Peters, inventor, New York.—In this instrument, which is on the refracting principle, the ordinary hinged cover to the aperture by which the light is admitted, instead of being, as usually constructed, opaque, consists of a frame of wood inclosing a glass of a rich ruby or other suitable tint, through which the light falls upon the picture, imparting to it a warmth of tone which is intended to remedy the somewhat ghastly appearance of stereoscopic daguerreotypes from life. The effect is good (and especially so for *statuary*, to which it imparts a general flesh-like hue, which is rather agreeable than otherwise); but for portraits, &c., from the life it does not, nor can any other contrivance supersede the almost imperative necessity for judicious colouring. It may here be suggested as an improvement upon the ordinary method of colouring *both* images of a stereoscopic pair to give to *one* of them *only* a *higher* degree of colouring, by which means (besides shortening and simplifying the operation) the necessary tints may be obtained, whilst the sharpness and distinctness of the one not coloured will be preserved.

No. 42. *Telescopes*, *Spy Glasses*, *&c.* Derne, manufacturer, New York.—The workmanship of these instruments is excellent. The opera glasses are particularly fine, both as regards the lenses and mounting.

No. 43. *Various Optical Instruments.* H. Waldstein, manufacturer, New York.—Among these instruments are some fine opera glasses and telescopes of *foreign manufacture.*

No. 50. *Reflective Goniometer and Polariscope.* Made by Duboscq-Soleil of Paris, for W. Phipps Blake, inventor and proprietor, New York.—The workmanship and finish of this instrument are highly creditable.

No. 90. *Optical Instruments, Lorgnettes, &c.* Charles Alt, New York.—This collection contains some excellent opera glasses made by Lang and Lacroix, as also some fair telescopes, eye-glasses, &c., of Mr. Alt's manufacture.

GREAT BRITAIN AND IRELAND.

No. 5. *Fine Steel Spectacles, &c.* J. Rowley, Manufacturer, Wolverhampton..—Fair specimens of the ordinary style of work, but not otherwise remarkable.

No. 7. *Stereoscopes, Telescopes, Spectacles, &c.* J. Solomon, manufacturer, London. —All these instruments are exceedingly well made and highly finished.

Messrs. Elliott and Sons, of London, also exhibit some admirable *Telescopes and Opera Glasses,* which are not mentioned in the Catalogue.

THE ZOLLVEREIN AND GERMANY.

No. 5. *Optical Instruments.* Emil Busch, manufacturer, Rathenow, Prussia.—Of ordinary workmanship.

No. 7. *Spectacles and Eye Glasses.* Riedel, manufacturer, Nuremberg, Bavaria.

No. 13. *Eye Glasses.* J. G. Landgraf, manufacturer Ditto Ditto

No. 28. *Spectacles, Optical Glasses, &c.* G. T. Kalb, Jun. Ditto Ditto.— All these are creditably got up, those of the last-named Exhibitor being somewhat superior to the others.

Mr. Goldbacher exhibits some very fair opera glasses which are not mentioned in the Catalogue.

FRANCE.

No. 12. *Opera Glasses.* Rengars, manufacturer, Paris.

No. 14. *Telescopes, Optical Glasses, and Lenses.* A. Lebrun, manufacturer, &c., Pierre le Bitry, near Paris.—All these instruments and glasses are of excellent quality, and highly creditable to their respective exhibitors.

No. 15. In the large and beautiful collection of Philosophical Apparatus manufactured and exhibited by Mr. Duboscq-Soleil, of Paris, there are several fine *Optical Instruments,* among which may be particularized the following:

A Silbermann's *Heliostal,* price 450 francs.

A very elegant and complete *Apparatus* for experimenting on *Artificial Light* (price 200 francs), to which there is an additional *adaptation* (price 70 francs) for *Microscopic Illustrations* by means of the *Electric Light,* &c.

An *Electric Light Apparatus* of M. Duboscq's contrivance (250 francs).

Several very fine *Stereoscopes,* upon the reflecting and refracting principles, with moveable eye-piece, ground glass base, &c.

A *Pseudoscope,* with *Models,* &c.—All of these instruments are of excellent workmanship, and reflect very great credit on the manufacturer.

No. 19. *Optical Glasses.* Lemaire, manufacturer, Paris.—These are decidedly *the finest* opera glasses in the Exhibition, which, considering the excellence of many of their rival competitors, is in the highest degree creditable to Mr. Lemaire.

SWIZERLAND.

No. 33. *Optical Glasses.* Theo. Daguet, manufacturer, Soleure, Neufchatel.—These opera glasses are of very good quality.

F. *Photographic Apparatus and Processes (Daguererotypes, &c).*

1. *Apparatus.*
2. *Daguerreotypes, Calotypes, &c.*

F 1. *Daguerreotype and other Photographic Apparatus.*

UNITED STATES OF AMERICA.

No. 66. *Improved Coating Box.* W. and H. Lewis, inventors and manufacturers, New York.—The American Sliding Coating Box is one of the most convenient forms of this indispensable article of apparatus, especially so for Portraits; its use, however, is not so general out of the States as it probably would be were it not for a certain amount of stiffness in its motion, accompanied generally by a harsh grating sound, occasioned by the friction of the slides against the ground edges of the glass pan (upon which it is forced by a spring in order to insure an air-tight joint). This objection, which becomes greatly magnified by the increased size of the box, Messrs. Lewis have completely and very ingeniously removed. To the under side of the slides are affixed four small friction rollers, which run upon slightly-elevated "ways," so that *whilst in motion* the friction is entirely taken off from the edges of the pan, and the slide can therefore be moved to and fro with great freedom and rapidity. In these "ways" there are slight depressions, so placed that, at each end of the motion, the rollers fall into them, so as to allow the slides to rest upon the edges of the pan, where it is kept down by a spring placed over the centre of the box. This spring presses upon a square piece of wood (of the size of the box), through which the pressure is communicated to the slides. (A still further improvement might be made by dispensing with this second cover, and causing the spring to act *directly* by means of a friction roller upon the back of the slides.) A new style of metal bridge-bar, bearing in the middle a socket for the reception of the spiral spring, is also introduced; it appears to be an improvement (though an expensive one) upon the old form of wooden bar. There is also a contrivance for maintaining any desired degree of temperature in the pan; but this part of the arrangement appears to be susceptible of improvement, both as regards efficiency and simplicity.

No. 68. *Daguerreotype Instruments and Cameras of various sizes.* C. C. Harrison, manufacturer, New York.—The Cameras exhibited by Mr. Harrison are of three different sizes, termed respectively "Whole," "Three-quarter," and "Half." They all have compound achromatic and periscopic lenses of short focal distances, which give a well-defined and sharp image, and, having been tried both for distant views and for portraits, were found to be admirably adapted for either purpose. The difficulty of so constructing lenses as to produce a picture equally perfect over the whole field, without shutting off a large portion of the light by means of diaphragms is well-known. Mr. Harrison appears to have overcome this difficulty as far as it is practicable to do so. The general style and finish of his Cameras and other apparatus are also highly creditable.

FRANCE.

Mr. H. Plant of Paris (not in the Catalogue) exhibits a Camera box (without lens) for taking photographs on paper, together with a Multiple Frame for holding a number of sheets of prepared (dry) paper, and transferring them to the Camera slide, and, again, from thence to the *opposite* side of the Frame (after having received the impression) without exposure to light. The whole apparatus appears to be ingeniously and judiciously contrived, and the workmanship and fitting (on which so much of its usefulness must depend) are admirable.

F 2. *Daguerreotypes, Calotypes, &c.*

This is one of the most extensive and diversified, and by no means the least interesting division of the whole Exhibition, as it contains upwards of *two thousand* pictures by various exhibitors, of whom there are about *thirty* in the American Department alone, many of them having sent very large collections (numbering in some instances near two hundred specimens!) The great extent to which this art is practised, and the degree of excellence to which it has attained in the United States, had already gained for the American Daguerreotypist a world-wide reputation, and, from the large proportion of Pictures of the highest merit which this Exhibition comprises, that reputation is rather increased than impaired.

There are so many distinct elements of success in the production of a really excellent Daguerreotype (such as the proper cleaning and preparation of the plate; the judicious and artistic "pose" of the subject, distribution of the light, and disposition of the dress and accessories; the focussing and *proper* degree of sharpness (so often *overdone*); warmth, softness, and depth of tone of the Picture, as resulting from peculiarity in the coating, the time of exposure, the fixing or the gilding, (artistic colouring, *when used*, &c., &c.); and artists vary so much in the degree of attention paid to one or more of these elements, *exclusively* or by preference. There is also such a diversity of style and of *taste* among artists, as well as amateurs, that it is very difficult to establish anything like a fair and strictly impartial comparison between the productions of various Daguerreotypists; nevertheless, as much rivalry exists in this matter, and as the public share largely in the interest which such rivalry excites, it has been endeavoured in the following notes to place the several collections (as *such*) as far as possible in the order of their respective merits. Those which are not noticed were either not to be found, or, being found, were not considered worthy of especial mention.

UNITED STATES OF AMERICA.

No. 51. S. Root, of New York, exhibits a collection of large *Crayon and other Daguerreotypes*—The arrangement of the subjects is deserving of high commendation; the Pictures are finely executed, the lights and shadows well and effectively arranged; the details of the Pictures are given with sufficient *minuteness*, and without any of that harshness which is so often observable in Daguerreotypes where "sharpness" is especially aimed at; the plates are admirably cleaned and prepared, and *all* the pictures in this collection appear to possess the same excellence.

No. 77. Alexander Helsen, Galena, Illinois, exhibits a very fine collection. "The

Favour Asked," "The Favour Granted," and "Almost Accepted," are highly artistic as Pictures, and possess great merit as Daguerreotypes; they are remarkable for their depth of colour and softness of shading. Some "Views of the City of Galena," and "Views on the Mississippi River," in the same collection, are also very creditably executed.

No. 52. M. A. Root, of Philadelphia, exhibits some fine specimens of *Portraits*, which are remarkable for the same *general* excellence as those exhibited by Mr. S. Root (No. 51).

J. A. Whipple, of Boston, (No. 70) exhibits several very beautiful positive *Photographs on Paper*, taken from negative Pictures on albumenized glass plates. The view of "Hancock House," Boston, possesses great merit, a quantity of foliage in the foreground being brought out with great distinctness and good effect. "Gardner House," "The Athenæum," and several *Portraits* taken by the same process (which Mr. W. has patented under the *new name* of "Chrystallotype"), may also be particularized as possessing great excellence. Mr. Whipple also exhibits one of his beautiful Photographic Pictures of the Moon, which have excited so much interest on both sides of the Atlantic.

No. 53. P. Haas, of New York, exhibits a number of very good pictures, which are remarkable for beauty, softness, and warmth of tone. A nicely-coloured *portrait* of Miss Esmond, as "Clara Douglas," is a very fine specimen of the art, and, taken altogether, one of the best in the Exhibition.

No. 81. M. B. Brady, of New York, exhibits a variety of Portraits, taken in different styles; most of them are exceedingly well executed, whilst several are remarkable for their fine soft shading. There are, in this collection, three pictures of a dark shade, which are considered the best of that style in the Exhibition.

No. 79. J. H. Fitzgibbon, of St. Louis, Missouri, exhibits a large miscellaneous collection. Many of the pictures are well executed. He also exhibits four *Electrotype Copper Copies* of *Daguerreotypes*, together with the originals from which they were taken. The appearance of the copper duplicate is decidedly superior, in tone and general effect, to that of the original pictures. They have also the advantage of not being reversed. It is much to be regretted that this very simple and successful process is not more generally adopted by Daguerreotypists. These are the only specimens in the Exhibition.

No. 72. Martin M. Lawrence, of New York, exhibits a collection of very good *Portraits*, in several of which the expression of the subject is caught with a life-like effect that is truly admirable. The portrait of "a Child laughing" is particularly fine. Mr. Lawrence's plates are beautifully cleaned and prepared.

No. 54. Jeremiah Gurney, of New York, exhibits several good *Daguerreotypes*, coloured in an unusually artistic style. Coloured Daguerreotypes are very generally objected to by persons of taste; and it is unquestionably too true that good pictures are frequently altogether spoiled from having been bedaubed by persons who certainly were not "artists," nor otherwise competent to the delicate task of successfully colouring a finely taken Daguerreotype; it is not uncommon, in such pictures, to find the cheeks and lips highly crimsoned, while the hair is left of an unnatural grey or inky hue; it seems almost needless to say that, where colouring is attempted, on a photographic picture, it must be done with very great judgment and taste to produce an artistic effect; but it may also be safely asserted, that *when* so performed the *improvement* of the portrait is the *certain* and *evident* result. It is probable that, from the fact that colouring is almost *imperatively* necessary for stereoscopic portraits of *living* subjects, more attention will, in future, be paid to this subject by "*Daguerrian artists.*"

Webster Brothers, of Louisville, Kentucky, No. 59, exhibit several good *Pictures*, and a frame of small-sized *Miniatures*, very finely executed in the crayon style.

Meade Brothers, of New York, No. 80, exhibit several very good *Plain* and *Coloured Pictures*. Shakspeare's "Seven Ages of Man," are finely illustrated in this collection. Many of their large Portaits are also deserving of particular notice.

G. M. Howe, of Portland, Maine (No. 82), exhibits a collection, comprising several well executed pictures. A large coloured "Portrait of a Lady," is deserving of especial notice for the beauty and softness of the shading and depth of tone.

E. Long, of St. Louis, Missouri (No. 71) exhibits a very large collection. Two of these pictures, the one of "Two Boys looking up from a Book," and the other a Landscape, in which the foliage is well brought out, are particularly fine.

Among the remaining exhibitors, the following may also be named as contributing pictures of much merit.

Masury and Silsbee, of Boston (No. 64) a collection of good *Portraits*.

J. Brown of New York (No. 83) a collection of *Portraits* of the *Officers of the Japan Expedition* (erroneously ascribed in the Catalogue to Mr. Brady, of New York, No. 81).

J. H. Whitehurst, of Baltimore, Maryland (No. 65), several excellent *Portraits*.

Capt. P. Von Schneidau, of Chicago, Illinois (No. 62), several fair pictures; one of them, "The Affectionate Friends," being excellent.

W. C. North, of Cleveland, Ohio (No. 58), a collection of *Miniatures*, under hemispherical lenses, producing an appearance of relief.

Harrison and Hills, of Brooklyn, New York (No. 78), several pictures of general excellence.

J. E. Whitney, of St. Paul's Mines, Sta. (No. 57), some well executed Views of the Falls of St. Anthony.

Great Britain and Ireland.

The only exhibitor in this department is Mr. J. E. Mayall, who contributes four large Views of the great London Exhibition of 1851, and one large *Portrait* (not mentioned in the Catalogue). All these pictures are very well executed; the views especially are very perfect, and probably the best specimens *of that style* in the Exhibition.

France.

No. 9. A frame containing *Photographic Illustrations* of various subjects. Evrard Blanquart, inventor and producer, Lille, Nord.—This is a collection of beautiful large photographic pictures, being proofs on paper, taken from paper negatives. They all exhibit great perfection of detail, combined with depth of tone and fine shading.

No. 13. Duboscq-Soleil, of Paris, exhibits several very beautiful *Stereoscopic Pictures* on silvered plates, on glass, and on paper. They are not excelled by any photographic specimens in the Exhibition.

H. *Surgical Instruments and Appliances.*

H 1. *Instruments.*

United States of America.

The display of these instruments in the American Department is neither extensive nor varied, and none of the articles appear to claim any especial mention; although some of them are creditable, the most noticeable among them being probably a highly finished set of silver *Bougies* and *Catheters* (No. 140), manufactured by W. Hughes (an *apprentice*) of Brooklyn, New York.

From the Zollverein, &c. there is a fair collection of *Surgical Instruments* (No. 26), manufactured by Moritz Wunche of Leipzic, Saxony.

France.

No. 26. *Surgical Instruments* of various descriptions. Charrière, jun. manufacturer, Paris.—This is a large collection of admirably finished instruments, many of them being of novel and ingenious construction.

No. 27. *Surgical Instruments.* Amatus Luer, manufacturer, Paris.—This is also a fine collection of instruments many possessing superior claims to notice on account of the originality of their construction; they are all exquisitely tempered and highly finished.

H 2. *Appliances.*

The American Department contains a great number and variety of *Surgical Appliances*, among them may be particularly mentioned the *Self-acting Eye* and *Ear Fountains* and *Artificial Human Eyes* (No. 118) of J. W. Powell, M.D., oculist and aurist, of New York.

An ingeniously contrived *Wooden Leg* (No. 126) by William Telpher of New York.

Some excellent *Surgeons' Splints of Wood* and *Gutta Percha*, and *Apparatus* for reducing Fractures (No. 152) by Ben. Weld of Lakeville, Connecticut.

Some good *Artificial Human Eyes* (No. 167) by J. Gray of New York.

An admirably contrived *Artificial Leg* (No. 168) (*the best in the* Exhibition), by Frank Palmer of Philadelphia.

A great variety of *Trusses, Bandages, Suspenders,* &c. (No. 172) by Marsh and Co., manufacturers, New York.

Several of these appliances are upon novel and sound principles of construction, and all of them are well made and neatly finished.

A good *Artificial Leg* (No. 174) by John O. Drake and Co. of New York.

Besides an extensive and varied collection of *Artificial Teeth* and of *Dentist Apparatus*, some of which are highly creditable to the Exhibitors.

Great Britain and Ireland.

No. 6. *Patent Self-adjusting* and other *Elastic Stockings*, &c. Longdon and Tabberer, patentee and manufacturer, Derby, England.

No. 19. *Surgical Elastic Appliances* without seam. Dr. C. Valleise, manufacturer, London.

All these articles are well contrived and handsomely finished; but too well known to require any explanation or description.

None of the other Departments of the Exhibition contained anything worthy of particular mention in this Division.

W. ANTROBUS HOLWELL.

INDUSTRIAL EDUCATIONAL INSTITUTIONS.

The United States takes rank above all other nations in its exertions for the education of the people. Nowhere else is information of *every* kind so generally diffused. Political parties of all shades agree in forwarding this good work. The subject is, however, far too large to be embraced in a visit necessarily so limited as mine. But though I do not propose to adduce evidence in proof of the great exertions made in every township throughout the States in aid of general education, nor to refer to the statistics of expenditure and the number of students, there is one fact which I think it right to notice. During the last five years there have been annual meetings of an association of gentlemen somewhat on the principle of the "British Association for the Advancement of Science." The title assumed is the "American Association for the Advancement of Education." The objects as set forth in the Constitution are "to promote intercourse among those who are actively engaged in promoting education throughout the United States, to secure the co-operation of individuals, associations, and legislatures, in measures calculated to promote education, and to give to such measures a more systematic direction and a more powerful impulse." Meetings have already been held in Philadelphia, Cleveland, Pittsburg, and the importance of the movement I was able to judge of from the number of districts represented on the first occasion, the only convention of which I was enabled to obtain a list of the delegates; but I can add that in 1853, when Professor Wilson and myself joined the meeting at Pittsburg for one day, there were representatives present from one end of the States to the other. That such meetings must have a beneficial consequence no one would doubt who had ever had the good fortune to attend such a meeting; but for an account of the results which the experienced and benevolent members anticipate from their annual meetings, I cannot do better than quote a few passages from the introductory speech of the Honourable Horace Mann, of Massachusetts, the first President of the Association.

"I suppose the great proportion of the gentlemen whom I see around me, and whose presence on this occasion I most cordially welcome, to be practical teachers,—men whose daily occupation is in the school-room. But from the fifteen States which are represented here, there are men of another class,—men who fill high and responsible offices in the great work of Public Instruction,—Secretaries of State, who are charged with the interest of Public Education in their respective States, Superintendents of Schools, Secretaries of Boards of Education, and others, to whose hands vast and precious interests have been confided, upon whom the most weighty responsibilities have been cast; and from whose administration, the matured fruits of wisdom are expected. Now all teachers have felt the genial and upholding influences of sympathy, in discharging the duties of the school-room. All have grown wiser while listening to the counsels of experience. The teacher who has met a hundred of his fellow-teachers in a public assembly, and communed with them for days, enlightening his own judgment by the results of their experience, and kindling his own enthusiasm by their fires, goes back to his school-room with the light of a hundred minds in his head, and with the zeal of a hundred bosoms burning in his heart.

"Now, if school teachers need this encouragement and assistance in their labours, and can be profited by them, how much more do those high officers need encouragement and assistance upon whom rests the responsibility, not of one school only, but of all the schools in a State. If the vision of the one, in his narrow sphere, needs enlightenment, how much illumination ought to be poured over the vast fields of the other? I see those around me who have been engaged in the great work of organizing systems of education for a State; I see those on whom has devolved the statesman-like duty of projecting plans of improvement for a whole people around them, and for generations after them, where a mistake would bring calamity to the most precious and enduring interests of mankind, and where wisdom and genius would throw forward their light and happiness into coming centuries; and I know I shall have their assent when I say that no position in human life could impose more anxiety and solicitude and toil upon its possessor, than the perilous position they have occupied. Without guide, without precedent, without counsel, they have had no helpers but in their own forethought, fidelity and devotion. How cheering and sustaining to them, must be such opportunities as the present, where the errors of others may become admonitions to them, and the successes of others may be used for their guidance.

"Still better is it, when the teachers of schools and the superintendents of schools can meet together, as on the present occasion, and render reciprocal aid in the discharge of their respective duties. At meetings like this, whatever wisdom the country possesses on the subject of education, may be brought into common stock, and by a self-multiplying process, the whole of it may be carried away by each individual. At least, so much of the whole may be carried away by each as he has capacity to receive.

"By a national organization of teachers, great and comprehensive plans may be devised, to whose standard each State may be gradually brought into conformity; for instance, such as relate to the organization of territory into school districts; to the proper age at which children should go to school; or, as the Germans so beautifully express it, when a child is 'due to the school;' to the gradation of schools, &c. &c. There are not more than two States in this Union, where the census of the school-going children is taken alike; where those between the same ages are considered as belonging to the school. When, therefore, one State reports a certain number of children, and another State another number, we cannot compare them, for they have not taken children between the same ages:—the result is the same when they report the number of children who are out of school. Now, we want uniformity in these matters, so that we may speak a common language; so that the same terms shall express the same ideas all over the country.

"Let me give an illustration of what I mean. Three or four days ago I was consulted with by a distinguished gentleman connected with the administration of schools, in regard to a School Register for the schools of a State. One column of the proposed Register was to be appropriated to a classification of the scholars, according to their conduct. It was proposed to enter three degrees of merit or demerit upon the roll. As I came through New York yesterday, I visited that establishment, so honourable to the city, the Free Academy. I there saw a merit-roll consisting of ten degrees. Now, measures and plans, differing from each other like these, exist all over the country, and are found on all subjects, in the different States, and in the different towns and schools in the same State. Now some of these must be better than others. A National association can select the best, and discard the others. Thus we shall have a common language, and not be compelled, as at present, to translate one State dialect into another State dialect, all over the Union.

"A similar idea has received the attention of great minds in regard to other subjects. In consequence of the diversity of the standards of weights and measures in different parts of Christendom, some of our greatest statesmen,—Mr. Jefferson, Mr. John Quincy Adams, and others, —have proposed negotiations, by which a common standard could be agreed on for all commercial nations, so that different nations can understand each others' terms, without translation, as the Arabic figures are now understood by all. In regard to our own country, our constitution has made this provision; and how much better it is for us all than if we used a different nomenclature in each of the States. For several years past, the Superintendents of Lunatic Asylums in this country have met together for the purpose, among other things, of defining terms and phrases, and of bringing their tables into conformity with an approved standard, so that wherever their reports are read, they may be intelligible to all on the face of them. Similar suggestions have been made in regard to the various currencies of Europe, the vocabulary of which is now more like a Babel, than befitting civilized communities. On all school subjects we want: first, the best way; and second, the universal adoption of the best way. This broad principle, however, does not exclude variations to suit the different circumstances of different communities.

"These advantages pertain to the head, to our ability to conduct the great work of education, in the wisest manner and to the most beneficial results. But the heart may be as much warmed as the head is instructed. By the communion and the sympathy of assemblies like this, we cannot only enlighten the guiding forces of the mind, but we can generate the impulsive forces of the heart. We can not only diffuse new intelligence, but we can excite new enthusiasm. Thoughout the whole country, the machinery of education needs to be increased in strength, and worked by a mightier power. In all material interests, we are proverbial as a people for our enterprise. Let us seek for our country the higher honour of becoming proverbial in our regard for moral and spiritual interests. Let us devise systems of education that shall reach every child that is born in the land; and wherever political privileges exist, let the intelligence be imparted and the virtues inculcated, which alone can make those privileges a blessing.

I have collected information concerning a few industrial institutions which came under my observation. More extended inquiries of this nature would have been made, but for the urgent necessity for my return to England.

METROPOLITAN MECHANICS' INSTITUTE, WASHINGTON.

This Institute was founded in August, 1852, and includes 9 members paying 25 dollars for a life-membership, 1,246 members paying an "initiation-fee" of one dollar and an annual subscription of two dollars, and 165 junior members paying the same entrance-fee and an annual subscription of one dollar. These last are minors, but not under 14 years of age, and are entitled to all the rights and privileges of members—eligibility to office, and the right to vote, only excepted. The revenue thus obtained is under the control of the Board of Management of the Institute, two-thirds of whom must be practical manufacturers and mechanics, and is employed on the following objects:—The formation of a library and reading-room, a cabinet of minerals and models and philosophical and mechanical apparatus; the establishment of a school of design, adapted to mechanical, manufacturing, and scientific purposes; the delivery of lectures on subjects connected with manufactures, mechanics, and the collateral sciences; the formation of a school of physics, and of practical and applied chemistry; the holding, in the city of Washington, of an Exhibition, annual or otherwise, of the productions of American skill and industry; the affording to inventors every reasonable facility for the trial and examination of their inventions by competent and impartial persons; and, lastly, the publishing from time to time the transactions of the Association, and such other matters as the Institute may direct.

Six months after the organization of the Institute, March, 1853, the first Exhibition was held. The classification of the articles exhibited was similar to that adopted in the London Exhibition of 1851, and the number of Exhibitors in each of the 30 classes was as follows:

Class		Class		Class	
1	12	11	5	21	12
2	22	12	9	22	47
3	71	13	1	23	2
4	2	14	5	24	8
5	52	15	2	25	2
6	7	16	13	26	35
7	17	17	10	27	7
8	22	18	0	28	4
9	16	19	604	29	253
10	83	20	35	30	184
				Total ..	1492

Besides these, there were about 100 more Exhibitors whose goods arrived too late to be entered in the catalogue.

A large number of persons, females as well as males, were appointed judges, who submitted their reports to a committee of awards, whose duty it was to confer a silver medal, as the highest premium, and two diplomas, of different grades, on the gentlemen depositors; while to the ladies and children they awarded articles of silver ware, jewellery, and books. From these reports I find that the number of persons considered worthy of mention, either as manufacturers or exhibitors, was as follows:

Class		Class		Class	
1	4	11	3	21	13
2	15	12	8	22	60
3	37	13	1	23	3
4	2	14	7	24	3
5	26	15	1	25	1
6	18	16	13	26	13
7	9	17	7	27	4
8	12	18	0	28	6
9	21	19	113	29	54
10	22	20	19	30	56
				Total ..	551

In those cases, where the number of awards exceeds the corresponding number of exhibitors, as shown in the previous table, it is to be understood that the judges thought proper to confer rewards on the several maufacturers of articles collected and deposited by one exhibitor.

The prices of admission were—Season-tickets for gentlemen, 1 dollar 50 cents; ladies, 1 dollar. A single admission was charged 25 cents. As members and junior members were admitted free, a large number of persons enrolled themselves as members by the respective payments of 3 dollars and 2 dollars.

THE FRANKLIN INSTITUTE, PHILADELPHIA.

The Franklin Institute at Philadelphia was incorporated in the year 1824, for "the promotion and encouragement of manufactures and the mechanic and useful arts, by the establishment of popular lectures on the Sciences connected with them, by the formation of a cabinet of models and minerals, and a library, by offering premiums on all objects deemed worthy of encouragement, by examining all new inventions submitted to them, and by such other measures as they may judge expedient."

The officers of the Corporation consist of a president, two vice-presidents, two secretaries, a treasurer, and twenty-four managers, two-thirds of whom must be manufacturers or mechanics, constituting together an honorary board of management, elected annually. The paid officers consist of an actuary and his assistant, an errand-boy, and a housekeeper. The number of members amounts to 2,300, of whom 500 are life subscribers. The annual subscription is 3 dollars (12*s.* 6*d.*); and a life subscription is 25 dollars (5*l.* 5*s*).

The lectures are held in a theatre, capable of accommodating about 400 persons, on Monday, Wednesday, and Friday evenings, for twenty-one weeks from the second Monday in November, under certain regulations laid down by the "Committee on Instruction." The several lecturers treat of distinct branches of mechanical science, thus enabling the members to follow any particular course which they may desire. Each lecturer receives about 10 dollars per lecture, and generally provides all the necessary models and diagrams which are not found in the cabinets of the Institute.

By the kindness of W. Hamilton, Esq., Actuary of the Institute, I am enabled to furnish the following list of the subjects of the lectures delivered during the last three years:

> "1850 and 51.—Principles of Mechanics—Application of Electricity and Light in the Arts—Comparative Physiology—American History—Mining Geology—Chemistry of Metalloids—Hydrostatics and Pneumatics—Physical Geography.
>
> "1851 and 1852.—Botany—Astronomy—Mining Geology—Influence of Air and Water on Natural Phenomena—Chemistry applied to the Arts—Chemistry of Metalloids—Comparative Physiology—Hydrostatics and Pneumatics.
>
> "1852 and 1853.—Botany—Warming, Ventilating, and Artificial Lighting of Buildings—Metallurgy, with special reference to the Arts—Physical Astronomy—Comparative Physiology—Organic Chemistry."

Each course consisted of about ten lectures.

The Library contains about 6000 volumes, and has a large reading-room attached, which is open every day, except Sunday. The great proportion of the books are, however, used as a Lending Library, by about 500 of the members, who on an average, take out about one volume a-week. These books are principally confined to scientific subjects. The Library, together with the cabinets of models, minerals, and geological specimens, is under the management of a standing committee, appointed by the president and approved by the Institute.

The Committee on Science and the Arts is the most important, and its duties are to examine—

> "Either as a body or by sub-committees, all inventions that may be submitted to them, and to make a detailed descriptive report, giving their opinion with candour and impartiality on the subject submitted.
>
> "2. It shall also be the duty of that Committee to institute and conduct, by sub-committees or otherwise, such scientific investigations as they may deem worthy of consideration, and to publish the results in the Journal of the Institute.
>
> "3. It shall further be the duty of that Committee, by sub-committee or otherwise, to inquire into and report upon, the state of the Arts generally, or of any branch thereof, when called upon to do so, in order to disseminate useful practical information, or historical facts in relation thereto."

The Institute has two premiums at its disposal, which can only be awarded by the Institute itself: the different committees being only entitled to recommend its bestowal. The first consists of a prize not to exceed 20 dollars (to be taken from the interest of a sum of money funded for the purpose), and a copper medal, with the inscription, "To the most deserving," to be bestowed on "ingenious men and women, who make useful inventions," in pursuance of the will of the late John Scott, of Edinburgh, chemist: the second is a gold medal provided for by the interest of a thousand dollars, bequeathed to the Institute by Elliott Cresson, Esq., of Philadelphia," and awarded for meritorious inventions and manufactures.

In connection with the Institute are a drawing-school and school of design for women, under the control of a committee appointed by the Board of Managers. This school may be suspended at any time, should the funds provided for its support be found inadequate to defray its current expenses; and all contracts or engagements contain provisions by which no instructor or assistant whose functions may be terminated by this suspension can claim compensation.

The president appoints ten ladies and ten gentlemen as a Committee of Visitors to the School of Design. The ladies are specially charged with the examination of the moral character of the applicants for admission as pupils, and the gentlemen report at certain stated meetings of the committee any subject or regulation which, in their opinion, may require consideration or amendment. This department has been treated on by Mr. Wallis.

The facilities afforded for enabling young men and non-subscribers to attend the lectures and reading-room are considerable. The pupils of the drawing school paying 5 dollars per quarter are entitled to attend all lectures without any additional charge. Each member, on the payment of his contribution, receives, besides a ticket for himself, one lady's ticket, and any further number of ladies' tickets, on payment of 2 dollars each (8*s.* 4*d.*). Minors who are the sons, daughters, or apprentices of members, are entitled to attend the lectures of the Institute, on the payment of one dollar each. It was further resolved by the Institute, in 1847, to admit to all its privileges, except that of voting at the meetings, the members of the "Alumni Association of the Philadelphia Central High Schools," until they arrive at the age of 21 years. In 1848 similar privileges were extended to the graduates of the Department of Arts of the University of Pennsylvania, under the same regulations.

The Franklin Institute has held, since 1824, in the second week of October, annual exhibitions of American manufactures, which are attended by a large number of persons. From the Catalogues of the Exhibitions held in 1850, 1851, and 1852, the following table has been compiled, showing the number of exhibitors in each of the classes into which the Exhibition was divided:

	Exhibitors.		
	1850	1851	1852
Models and Machinery (Classes v. vi.)	74	123	124
Iron, steel, copper, brasswork, &c. (xxii.)	26	15	7
Stoves and grates (xxii.)	39	40	19
Coachwork and agricultural implements (v. ix.)	16	21	22
Housekeeping articles (iii. xxix.)	29	24	28
Cotton goods (xi.)	16	17	23
Woollen goods (xii. xv.)	19	10	10
Carpets, oilcloths, and silks (xix. xxix. xiii.)	16	24	11
Hardware, cutlery, and tin-work (xxii. xxi.)	61	70	47
Silver-plating, locks, and door furniture (xxii.)	„	11	5
Cabinet furniture and upholstery (xxvi.)	23	27	29
Lamps and gas-fixtures (xxii.)	5	1	6
Marble and statuary, glass and china (xxx. xxiv. xxv.) ..	14	2	8
Silver-ware and jewellery, music (xxiii. x.)	23	25	18
Fine Arts (xxx.)	90	93	100
Philosophical apparatus, surgical instruments and dentistry (x.)	34	29	30
Books and stationery (xvii.)	24	18	20
Leather and morocco, saddlery, harness, and trunks (xvi.) ..	34	31	36
Boots and shoes, furs, hats, and caps (xvi. xx.)	28	10	21
Combs and brushes, gum-elastic goods (xxix.)	9	9	8
Chemicals, perfumery, paints, and colours (ii. xxix.)	61	36	52
Paper-hangings and straw goods (xxvi. xxix.)	6	3	4
Clothing, needle-work, and miscel. articles (xx. xix. xxix.) ..	99	115	112
	746	753	740

If the articles exhibited had been arranged according to the classification adopted in the London Exhibition of 1851, the number of exhibitors would have been, as nearly as possible, as follows:

Classes	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII. XV.	XIII.	XIV.
Exhibitors in 1850......	..	30	17	..	26	50	..	..	12	47	18	22	7	..
„ 1851......	..	9	12	..	87	53	..	..	15	45	17	10	11	..
„ 1852......	..	14	16	..	91	39	..	..	16	41	23	11	8	..

Classes	XVI.	XVII.	XVIII.	XIX.	XX.	XXI.	XXII.	XXIII.	XXIV.	XXV.	XXVI.
Exhibitors in 1850	38	24	..	49	45	23	108	10	2	3	29
„ 1851	35	18	..	47	28	35	102	12	3	1	29
„ 1852	40	20	..	40	20	19	85	10	4	3	32

Classes	XXVII.	XXVIII.	XXIX.	XXX.
Exhibitors in 1850	..	..	81	99
„ 1851	..	..	113	93
„ 1852	..	..	123	104

The "Committee on Exhibitions" appoints a large number of judges (300), consisting of both ladies and gentlemen, who inspect the goods. Reports are then made by the judges to the Committee on Exhibitions; these are revised, adopted, and, upon their recommendation, the awards of premiums are made by the Committee, a short synopsis of which is read to the Exhibitors during the afternoon of the last day of Exhibition. The premiums awarded to Exhibitors are quite distinct from those mentioned above, which it is not in the power of the Committee on Exhibitions to bestow. They consist of "the gold medal, the first premium (silver medal), the second premium (bronze medal), and the third premium (certificate)."

From the Reports of the Judges, it would appear that, according to the classification of 1851, the number of prizes awarded was as follows, in the last three Exhibitions:

	1850	1851	1852		1850	1851	1825
Classes I.	..	..	..	Classes XVIII.	..	..	..
II.	21	10	21	XIX.	23	11	27
III.	8	14	17	XX.	20	8	20
IV.	..	..	..	XXI.	13	7	9
V.	28	73	40	XXII.	103	97	76
VI.	12	21	10	XXIII.	7	11	9
VII.	..	..	..	XXIV.	1	3	4
VIII.	..	..	..	XXV.	1	1	..
IX.	9	15	16	XXVI.	15	28	28
X.	36	29	14	XXVII.	..	..	..
XI.	18	8	6	XXVIII.	..	..	..
XV. XII.	22	9	11	XXIX.	55	49	42
XIII.	7	11	2	XXX.	26	21	32
XIV.	..	..	..				
XVI.	36	38	40	Total..	470	473	436
XVII.	9	9	12				

The Exhibition is open free to Members, who have, besides, six tickets given to them for distribution among ladies or minors, and to Exhibitors, who have three tickets given to them for the same purpose, and for as many assistants as they may require. All non-subscribers are admitted on payment of 25 cents (1*s.*). With respect to schools, arrangements are made according to the numbers; the sum usually charged being 5 cents (2½ *d.*) per head.

I have no means of estimating the value of the goods exhibited. I must also remark that the Catalogues were printed and issued on the day of opening, and contain only those articles received up to the previous evening, after which time no goods were received for competition and premiums, but only for exhibition. A large number of articles were consequently included in the Exhibition, of which the Catalogues made no mention.

THE MARYLAND INSTITUTE, BALTIMORE.

The Maryland Institute was organized in 1848, and two years afterwards was incorporated for the encouragement and promotion of manufactures and the mechanical and useful arts, by the establishment of popular lectures upon the sciences connected with them; by the formation of a School of Design adapted to mechanical and manufacturing purposes; for providing a Library, Reading-room, and a Cabinet of minerals, models, and mechanical apparatus; for holding annual Exhibitions or Fairs for articles of *American manufacture*, and for offering premiums, or rewards, for excellence in those branches of national industry deemed worthy of encouragement; by examining new inventions submitted for that purpose, and by such other means necessary for the accomplishment of their objects as experience may suggest." In the same year, the General Assembly of Maryland granted an annuity of 500 dollars (£102) to the Institute, payable to the President, provided "the said Institute is in efficient operation at the time of such payment."

The Institute is under the management of a President, two Vice-Presidents, two Secretaries, two Treasurers, and 24 Directors, two-thirds of whom must be practical manufacturers or mechanics. These officers are elected annually, and constitute an honorary Board of Management: the only paid officers being an Actuary and his assistant.

In June, 1853, the number of members amounted to about 3,100, paying 3 dollars (12*s.* 6*d.*) per annum, and 2 dollars entrance, making 5 dollars (£1 1*s.*) for the first year. Any person may become a life-member on payment of 25 dollars (£5 5*s.*).

Lectures are delivered before the Institute from the month of November until March, generally twice a-week, in the saloon or hall of the Institute, which is 250 feet long by 55 feet wide, and upwards of 32 feet high, with a gallery running entirely round the hall, supported by iron brackets thus obviating the necessity of obstructing the floor by columns, and which will accommodate about 2,000 persons, while 4,000 more may be seated, or 6,000 stand, on the main floor. The average number attending the lectures is about 2,000 persons. The attendance of non-subscribers, though small, has been found nearly sufficient, by the payment of 25 cents (1*s.*) each for admission, to meet the expenses of the lectures. The subject of the lecture is left in some measure to the taste and good sense of the lecturer; but, as stated above, it must be mainly connected with manufactures, mechanics, and the useful arts. Few of the lecturers receive fees, beyond the discharge of travelling and other expenses incurred by them when brought from a distance: the opportunity of lecturing before a large audience being often a sufficient inducement, in the United States, to the scientific or literary man.

The subjects of the lectures, as given in the Report of the Committee on Lectures, delivered during 1851-52, have been:

The Position, Duties, and Responsibilities of the Mechanic—The Position, Prospects, and Destiny of the City of Baltimore—The Glaciers or the Mountains of the Alps—Architecture—Labour of the Mind and of the Body—The Industrial Exhibition of 1851—The Arctic Region, in connection with the search after Sir John Franklin—Astronomy—Marine Architecture—The Pacific, its Islands and People—Music as a Branch of popular education—Acoustics—The practical triumphs of Modern Chemistry—The political condition and prospects of Spain—The Industrial and Social Relations of Man, in Europe and America.

In the Report of the Committee on lectures for 1852-53, the *subjects* of the lectures are not furnished.

A member's ticket (not transferable) will admit himself and two ladies. A non-subscriber's season-ticket may be purchased for 1 dollar, and the public is admitted to each lecture on payment of 25 cents per head.

The Library contains about 3,500 volumes, and is open every evening, except Sunday, from dusk till 10 P.M. A large portion of the books is devoted to scientific and mechanical subjects; but there are many works, besides, on education and general literature. Each member has the privilege of borrowing books from the Library, under certain regulations, and about 1,600 (chiefly junior members, under 21 years of age) avail themselves of it, and take out, on an average, 150 volumes per day. It is the duty of the Committee on the Library to purchase suitable books, maps, &c., to the extent of the funds appropriated for their use; but for this purpose, there is no specific sum, and the Board of Managers, from time to time, makes such appropriations as circumstances permit. In 1851-52, 222 new books were purchased, and 443 acquired by donations; and the expenditure amounted to 348 dollars, 87 cents. In 1852-53, the number of volumes purchased amounted to 505; 208 were received by donation; and the expenses amounted to 585 dollars, 69 cents. A small collection of minerals and curiosities has lately been commenced.

The School of Design, established in accordance with the terms of the charter of incorporation, is under the management of a Committee, who undertake the appointment of competent teachers, and generally have the entire control of the School, merely making reports to the Board, detailing the results of their operations, and showing the progress made. The School is open for a term of 4 months, from November to March, and, as a general rule, is held on the evenings of Monday, Wednesday, and Friday, in each week. It is divided into six classes; viz., Elementary, Geometrical, Mechanical, Architectural, Engineering, and Artistic. Premiums of graduated value are bestowed, according to the degree of excellence which characterizes the work of the recipients; and scholars who have passed through the highest department, and, on examination, have been deemed worthy, receive a diploma, signed and sealed by the proper officers of the Institute; a charge of 5 dollars, as a graduation-fee, being made for such diploma.

The Maryland Institute has held five annual Exhibitions of American manufactures. From the Catalogues of the Exhibitions, held in the month of October, in 1850, 1851, and 1852, the following table has been compiled, showing the number of Exhibitors in each of the classes into which the Exhibitions were divided:

Classification: Maryland Institute, 1850–51–52.	London.	Maryland Institute.		
	1851.	1850.	1851.	1852.
1. Cotton and linen goods	XI. XIV.	15	29	28
2. Clothes, cassimeres, and other woollen goods	XII. XV.	8	32	34
3. Silk goods and raw silk	XIII. IV.	5	6	3
4. Straw goods and millinery	XXIX. XIX.	7	11	13
5. Carpets, oil-cloths, matting, and rugs	XIX. XXIX.	4	14	13
6. Gum-elastic goods, umbrellas, whips, and canes	XXIX.	6	6	5
7. Men's and boys' clothing	XX.	..	21	5
8. Needle-work and infants' clothing	XIX. XX.	118	332	123
9. Quilts, counterpanes, and tidies	XIX.	..	...	213
10. Department for juveniles, very aged, and infirm persons; needle-work, quilts, and embroidery	XIX.	..	..	285
11. Same department: fancy and miscellaneous articles	XXIX.	..	..	142
12. Worsted work and embroidery	XIX.	77	244	274
13. Banners, regalia, and trimmings	XIX.	3	22	4
14. Hats, caps, and furs	XX. XVI.	5	11	9
15. Boots, shoes, and shoe bindings	XX.	8	11	7
16. Ladies' and children's shoes and gaiters	XX.	..	4	15
17. Saddlery, harness, and trunks	XVI.	3	4	8
18. Leather, morocco, &c.	XVI.	7	17	21
19. Combs and brushes	XXIX.	3	1	2
20. Perfumery, extracts, and fancy soaps	XXIX.	.	7	18
21. Cabinet ware, chairs, and furniture	XXVI.	5	20	27
22. House-keeping articles	XXIX.	10	27	18
23. Paper-hangings and upholstery	XXVI.	14	7	8
24. Stoves and grates	XXII.	5	10	9
25. Wire-work and sieves	XXII.	..	9	4
26. Hollow glass and earthenware	XXIV. XXV.	6	10	7
27. Silver and plated ware and jewellery	XXIII.	2	17	10
28. Clocks, watches, and chronometers	X.	..	5	5
29. Lamps and gas fixtures	XXII.	..	3	1
30. Hardware and cutlery	XXII. XXI.	14	24	15
31. Copper, tin, and plumbers' work	XXII.	8	12	5
32. Brass, iron, and steel; cast and wrought	XXII.	10	20	13
33. Hollow-ware castings	XXII.	..	..	7
34. Carpenters' and turners' work and tools	XXI.	12	16	11

Classification : Maryland Institute, 1850–51–52.	London.	Maryland Institute.		
	1851.	1850.	1851.	1852.
Brought over				
35. Models and new inventions	V. VI.	54	16	54
36. Mill machinery	VI.	..	60	3
37. Agricultural machinery and implements	IX.	10	13	33
38. Working machinery, not in other classes	VI.	..	..	23
39. Scales, patent balances, and safes	XXII.	..	..	6
40. Fire apparatus, hose, &c.	VII.	..	..	..
41. Philosophical and mathematical apparatus	X.	9	..	2
42. Dentistry, dental and surgical instruments	X.	9	12	8
43. Door-locks, door and window fixtures	XXII.	..	4	5
44. Guns, gun-locks, and gunning apparatus	VIII.	..	2	9
45. Boats, ship-models, tackle, blocks, and pumps	VIII.	..	19	9
46. Fine arts	XXX.	49	105	113
47. Daguerreotypes and daguerreotype material	X.	..	..	4
48. Engraving, lithography, printing, and penmanship	XXX.	..	..	17
49. Bookbinders' work, paper, and stationery	XVII.	2	9	6
50. Lettering and graining	XXVI.	5	9	13
51. Carving and gilding	XXVI.	..	4	12
52. Musical instruments	X.	8	9	7
53. Coach work	V.	..	6	3
54. Marble and stone work	XXVII.	5	7	11
55. Chemicals, paints, colors, and window-glass	II.	17	30	12
56. Starch, mustard, chocolate, ground spices, &c.	III.	..	..	12
57. Flour, cheese, honey, and agricultural products	III.	13	17	12
58. Horticulture	..	..	..	1
59. Tobacco and cigars	IV.	..	7	18
60. Navy and ship bread and crackers	III.	..	..	3
61. Confectionery, jelly, preserves, and pickles	XXIX.	..	170	193
62. Wines, cordials, mineral water, &c.	XXIX.	..	..	23
63. Fancy articles	XXIX.	75	..	160
64. Miscellaneous articles	XXIX.	63	79	69
	Total ..	674	1530	2194

According to the classification of the London Exhibition, the number of Exhibitors appears to have been, as nearly as possible, as follows :

Classes	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII. XV.	XIII.	XIV.
Exhibitors in 1850	..	17	1	14	16	38	..	..	10	26	8	8	3	7
„ 1851	..	30	17	8	22	60	..	21	13	26	10	32	5	9
„ 1852	..	12	17	19	33	41	..	18	33	26	18	34	2	10

Classes	XVI.	XVII.	XVIII.	XIX.	XX.	XXI.	XXII.	XXIII.	XXIV.	XXV.
Exhibitors in 1850	12	2	..	179	40	15	34	2	4	
„ 1851	25	9	..	568	95	24	74	17	6	4
„ 1852	29	6	..	814	146	20	57	10	5	2

Classes	XXVI.	XXVII.	XXVIII.	XXIX.	XXX.
Exhibitors in 1850	24	5	..	221	49
„ 1851	40	7	..	293	105
„ 1852	60	11	..	631	130

Judges are appointed to examine the articles exhibited, and, on their recommendation, the Committee on Premiums award gold, silver, and bronze medals to the successful male contributors, and other prizes, consisting chiefly of articles of jewellery, to the female Exhibitors.

From the Reports of the Judges the following table is compiled, showing the number of Exhibitors who were thought worthy of mention, arranged according to the London classification of 1851:

	1850	1851	1852		1850	1851	1852
Classes I.	..	..	..	Classes XVIII.	..	..	..
II.	4	..	1	XIX.	59	112	172
III.	..	15	21	XX.	12	38	56
IV.	10	4	10	XXI.	15	11	20
V.	14	17	30	XXII.	29	53	48
VI.	18	7	14	XXIII.	2	12	4
VII.	..	..	..	XXIV.	4	5	4
VIII.	..	8	7	XXV.	2	4	2
IX.	8	4	12	XXVI.	15	25	28
X.	20	21	16	XXVII.	..	6	6
XI.	16	15	17	XXVIII.	..	..	..
XV. XII.	6	19	34	XXIX.	59	98	202
XIII.	3	6	3	XXX.	14	10	34
XIV.	6	6	8				
XVI.	11	23	29		328	523	782
XVII.	1	4	4				

Members of the Institute are furnished with a ticket which will admit the *owner* and a lady or two children at all exhibition hours; besides which he may obtain six single admission tickets for ladies or children only. This ticket further secures to its owner the privilege of admission, with a lady, to all the lectures delivered at the Institute, besides the free use of the School of Design and the Library, and a vote at the business meetings. Exhibitors receive a "ticket of title" to their goods (not transferable), which ticket will also admit them to the Exhibition at all times when open to the public.

Two kinds of season-tickets have been sold; those at 1 dollar, admitting one person; and those at 3 dollars, admitting a gentleman and any lady who may accompany him. The price of a single admission was 25 cents.

With regard to the admission of schools, no special arrangements were made. The charge varied from 10 to 12½ cents per head, according to number of scholars and age of the pupils.

A large number of articles was received at the two last Exhibitions too late to be entered under the regular classification adopted in the Catalogue; and, according to the rules of the Committee on Exhibitions, such Exhibitors could not compete for a premium. These last articles are placed at the end of the regular catalogues.

For much of the information contained in this account of the Maryland Institute, I am indebted to Mr. John S. Selby, Actuary, and Mr. William H. Young, Corresponding Secretary, of the Institute.

THE MERCANTILE LIBRARY ASSOCIATION, BALTIMORE.

This Association, incorporated since 1842, is "for the promotion of literature and science, by the establishment of a Library and Reading-room, Lectures, and by such other methods as shall be deemed expedient or necessary, to the furtherance of this design."

It consists of active and honorary members, of about 1,000 persons, of whom the former pay 3 dollars, and the latter 5 dollars for the privilege of using the Reading-room and borrowing the books, which are lent out under certain regulations. Nine tenths of the members avail themselves of the privilege of taking the books to their houses and places of business, and between 400 and 500 books are borrowed weekly. The total number of books in the Library amounts to about 15,000, and it appears to have been recommended by the

Directors for the year ending, November, 1852, that a sum of 1,800 dollars should be set apart from the funds of the Association for the purchase of books.

THE ODD FELLOWS' LENDING-LIBRARY, BALTIMORE.

The Independent Order of Odd Fellows, of Baltimore, have established a Lending-Library, within the last five years, which contains upwards of 10,000 volumes, and is rapidly increasing—at the rate of about 100 volumes per month. There are about 8,500 members, and it is estimated that about a fourth part make use of the privilege of borrowing the books, of which about 404 are taken out weekly. The members pay no subscription; but the several Lodges make yearly appropriations of a fixed amount to the use of the Library, varying from 120 dollars to 15 dollars. This sum has averaged, for the last four or five years, 1,000 dollars (£203 6*s.* 8*d.*). Lectures were delivered, in the Hall of the Library, in the winter of 1849-50; but there are no arrangements made for regular courses.

THE SMITHSONIAN INSTITUTION.

This magnificent establishment, founded at Washington out of funds bequeathed for that purpose by an English gentleman, is exercising so much influence throughout the United States, and I may also say throughout the world, that I feel bound to give some account of it, and also of its course of action. Mr. Hugh Smithson, one of the family of the present Duke of Northumberland, died at Genoa, on the 27th of June, 1829, leaving a fortune of about £120,000. By his will he desired that the income arising therefrom should be paid to his nephew, H. G. Hungerford, during his life, and that the property itself should descend to his children, if he had any, absolutely; but the will went on to say—

> "In case of the death of my said nephew without leaving a child, or children, or of the death of the child or children he may have had, under the age of 21 years, or intestate, I then bequeath the whole of my property (subject to an annuity of 100 pounds to John Fitall, and for the security and payment of which, I mean stock to remain in this country) to the United States of America, to found at Washington, under the name of the Smithsonian Institution, an establishment for the increase and diffusion of knowledge among men."

The circumstances of this bequest are somewhat remarkable. Nothing is known of the reasons which induced the testator to select a city in the United States for the site of the proposed Institution. He had never been, it is believed, in America, and is supposed to have had no predilection for republican forms of Government; nor does it appear, from anything found among his book and papers, or from the recollections of his associates, that he had ever taken a special interest in the people of the United States. In June, 1835, Mr. Hungerford died without issue, and in July, 1836, a bill was passed by Congress to empower the President of the United States to appoint a special Agent who should act in England, and receive the amount thus become due to the United States' Government.

In September 1838 the money, $515,169, was paid over by the English Court of Chancery to the Hon. Richard Rush, the agent appointed by the Government of the United States; and eight years after, on the 10th of August, 1846, an Act was passed for the purpose of establishing the Smithsonian Institution.

> "This Act creates an establishment to be called the Smithsonian Institution, composed of the President and Vice-President of the United States, the Secretaries of State, of the Treasury, of War, and the Navy, the Postmaster-General, Attorney-General, and Mayor of Washington, with such others as they may elect Honorary Members. It devolves the immediate government of the Institution upon a Board of Regents, of fifteen members; namely, the Vice-President of the United States, the Chief Justice of the Supreme Court, and the Mayor of the city of Washington, *ex officio*, three members of the Senate, to be appointed by the President thereof, three members of the House to be appointed by the Speaker, and six persons to be chosen from the citizens at large, by joint resolution of the Senate and House, two of whom shall be members of the National Institute, and the other four inhabitants of States, and no two from the same state.

"The Act also establishes a permanent loan of the original fund ($515,169) to the United States at six per cent. interest; appropriated the accumulated interest, then amounting to $242,129, or so much as might be needed, together with so much of the accruing income as might be unexpended in any year, for the erection of a building; provided for the establishment of a Library, Museum, Chemical Laboratory, &c., and left most of the details of the organization to the Board of Regents."

The very general terms of the bequest gave rise to difficulties as to the best mode of carrying the wishes of the testator into effect; but the Board of Regents having in the outset been fortunate enough to secure the services of Joseph Henry, L.L.D., of Princeton College as Secretary and Chief Executive Officer of the Institution, they empowered him to draw up a programme of organization, which was adopted by the Regents in 1847, and as the principal points in this programme are given in Professor Henry's Report to the Board, dated 1st of January, 1851, I have thought it better to quote a few passages.

"Smithson left his property, in case of the death of his nephew, to whom it was first bequeathed, "to found at Washington under the name of the Smithsonian Institution, an establishment for the increase and diffusion of knowledge among men." These are the only words of the testator to serve as a guide to the adoption of a plan for the execution of his benevolent design. They are found, however, when attentively considered, to admit of legitimate deductions sufficiently definite and comprehensive.

"1. The bequest is made to the United States, in trust for the good of *mankind*.

"2. The objects of the Institution are two-fold; first, to increase, second, to diffuse knowledge; objects which, though often confounded with each other, are logically distinct, and ought to be separately regarded. The first is the enlargement of the existing stock of knowledge by the discovery of new truths, and the second is the dissemination of these and other truths among men.

"3. No particular kind of knowledge is designated, hence a liberal interpretation of the bequest will exclude no part of the great domain of science and literature from the degree of attention its importance may demand.

"4. Since mankind are to be benefited by the bequest, any unnecessary expenditure on merely local objects would not be in accordance with the proper administration of the trust.

"5. Though the funds are generally considered large, and much is expected of them, they are really small in proportion to the demands made upon them. The annual income of the bequest is less than half the cost of the publication of a single yearly report of the Patent Office.

"6. In order, therefore, that the limited income may effect the greatest amount of good, it should be expended in doing that which cannot be done as well by other means.

"These views, which have commanded the assent of all unprejudiced and reflecting persons who have studied the subject, have been the guiding principles in all cases in which I have had any power of direction, and I am happy to say they are fully adopted by the present directors and officers of the Institution.

"To carry out the design of the testator, various plans were proposed, but most of these were founded on an imperfect apprehension of the terms of the Will. The great majority of them contemplated merely the diffusion of popular information, and neglected the first and the most prominent requisition of the bequest, namely: the "increase of knowledge." The only plan in strict conformity with the terms of the Will, and which especially commended itself to men of science, a class to which Smithson himself belonged, was that of an active living organization, intended principally to promote the discovery and diffusion of new truths by instituting original researches, under the direction of suitable persons, in History, Antiquities, Ethnology, and the various branches of Physical Science, and by publishing and distributing among libraries and other public institutions, accounts of the results which might thus be obtained, as well as of those of the labours of men of talent which could not otherwise be given to the world.

"This plan, which was probably in the mind of the donor when he gave expression to the few but comprehensive words which indicate the objects of the bequest, is found from our experience to be eminently practical. It requires no costly building or expensive permanent establishment. Its operations, limited only by the amount of the income, are such as to affect the condition of man wherever literature and science are cultivated, while it tends in this country to give an impulse to original thought, which, amidst the strife of politics, and the inordinate pursuit of wealth, is of all things most desirable.

"It was with the hope of being able to assist in the practical development of this plan, that I was induced to accept the appointment of principal executive officer of the Institution. Many unforeseen obstacles, however, presented themselves to its full adoption, and its advocates soon found in contending with opposing views and adverse interests, a wide difference between what, in their opinion, ought to be done and what they could actually accomplish.

"The plan was novel, and by many considered entirely chimerical; indeed it could not be properly appreciated except by those who had been devoted to original research. Besides this, the law of Congress incorporating the Institution, while it did not forbid the expenditure of a part of the income for other objects, authorized the formation of a Library, a Museum, and a Gallery of Art, and the erection of a building, on a liberal scale, for their accommodation. It was indeed the opinion of many that the whole income ought to be expended on these objects. The Regents did not consider themselves at liberty to disregard the indications of Congress, and the opinion expressed in favour of Collections, and after much discussion it was finally concluded to divide the income into two equal parts, and, after deducting the general expenses, to devote one half to the active operations set forth in the plan just described; and the other, to the formation of a Library, a Museum, and a Gallery of Art.

"It was evident, however, that the small income of the original bequest, though in itself sufficient to do much good in the way of active operation, was inadequate to carry out this more extended plan; to maintain the staff of attendants, and to defray other contingent expenses incidental to a large establishment of this kind. Besides the Secretary and an Assistant to attend to the general operations, two principal assistants would be required, one to take charge of the Library and the other of the Museum of Natural History, and to these sufficient salaries must be given to secure the services of men of the first reputation and talents in their respective lines. It therefore became absolutely necessary that the income should be increased; and, in order to do this, it was proposed to save the greater part of the $242,000 of accrued interest which Congress had authorized to be expended in a building, by erecting, at a cost not to exceed $50,000, the nucleus of an edifice which could be expanded as the wants of the Institution might require, and to add the remainder to the principal.

"Unfortunately, however, for this proposition, Congress had presented, to the Institution, the great Museum of the Exploring Expedition, and a majority of the Regents, supposing it necessary to make immediate provision for the accommodation of this gift, had taken preliminary steps, previous to my appointment, to construct a large building, and indeed a majority of the committee, to which the matter was referred, had determined to adopt the plan of the present edifice. Strenuous opposition was, however, made to this; and as a compromise it was finally agreed to draw from the United States' Treasury 250,000 dollars of accrued interest, and instead of expending this immediately in completing the plan of the proposed building, to invest it in treasury notes, then at par, and to finish the building in the course of five years, in part out of the interest of these notes, in part out of the sale of a portion of them, and also in part out of a portion of the annual interest accruing on the original bequest. It was estimated that in this way, at the end of five years, besides devoting 250,000 dollars to the building, the annual Income of the Institution would be increased from 30,000 to nearly 40,000 dollars, a sum sufficient to carry out all the provisions of the programme.

"After the resolutions relative to the division of the income between collections on the one hand and active operations on the other had been adopted, and the plan of finance as to the building had been settled, I was requested to confer with persons of literary and scientific reputation, and to digest into the form of a general programme the several resolutions of the Board. In the programme which was thus produced and afterwards adopted, it is attempted to harmonize the different propositions of the Board and to render them all, library, collections, &c., as far as possible, subservient to a living, active organization. Though a valuable library will in time be accumulated, by donation and the exchange of the publications of the Institution, the design at first is to purchase only such books as are immediately necessary in the other operations of the Institution, or which cannot be procured in this country, and the Librarian is required to perform other duties than those which pertain to the office of an ordinary collector and curator of books. He is directed to report on plans of libraries, and the best method of managing them; to collect the statistics of the libraries of the United States; to make a general catalogue as far as possible of all the books in this country, and to procure all the information necessary for rendering the Institution a centre of bibliographical knowledge. Instead of attempting to form a miscellaneous collection of objects of nature and art, it is proposed to collect only those which will yield a harvest of new results, and to preserve principally such as are not found in other collections, or will serve to illustrate and verify the Smithsonian publications.

"The tendency of an Institution in which collections form a prominent object, is constantly towards a stationary condition; with a given income, the time must inevitably come when the expenditures necessary to accommodate the articles with house room and attendance will just equal the receipts. There is indeed no plan by which the funds of an Institution may be more inefficiently expended, than that of filling a costly building with an indiscriminate collection of objects of curiosity, and giving these in charge to a set of inactive curators. Happily, the programme of organization and the system of expenditure which the Regents have adopted, if rigidly adhered to, will prevent this state of things, and happily the spirit of the present directors and officers who are to give the initial form to the character of the Institution, is in accordance with as active operations as the state of the funds and requisitions of Congress will allow.

"It is to be regretted that Congress did not leave the entire choice of the plan of organization to those who were to be entrusted with the management of the bequest, and that instead of the plan of a costly building, there had not been adopted the nucleus of a more simple edifice, which could have been modified to meet the wants which experience might indicate.

"The original estimate for the building, furniture and improvement of the grounds, was 250,000 dollars, and could the actual cost have been confined to this sum, all the results anticipated from the scheme of finance which had been adopted, would have been realized at the end of five years. During the past year, however, it has been found necessary, for the better protection of the collections, to order the fire-proofing of the interior of the edifice at an increased expense of 44,000 dollars. This additional draft on the funds can only be met by extending the time for the completion of the building, and even this will require the appropriation of a portion of the income which ought to be devoted to other purposes. The active operations will suffer most by this draft on the income, since it will be made for the better accommodation of the Library and the Museum.

"It must not be inferred from the foregoing account, that the affairs of the Institution are in an unfavourable condition; on the contrary, though they are not in every respect what could be wished, still, under the circumstances I have mentioned, they are much better than could have been anticipated. The funds are in a very prosperous state and all the obstacles in the way of the usefulness of the establishment, may, by judicious management in time be removed. The opposition which was made to the building, led to the adoption of the plan of finance to which I have heretofore adverted, and from this has been realized much more than could have been expected.

"After all the expenditures which have been made on the building, grounds, publications, researches, purchase of books and apparatus, not only is the original bequest untouched, but there is now on hand upwards of 200,000 dollars of accrued interest. This will be sufficient to finish the exterior of the building, including all the towers, the interior of the wings, ranges, and a part of the interior of the main edifice, which will afford sufficient accommodation for some years to come, and leave 150,000 dollars to be added to the principal.

"This result has been produced by a rigid adherence to the determination of increasing the annual income, and in accordance with this, and in obedience to the direction of the Board of Regents, a petition has been presented to Congress, asking that 150,000 dollars may be taken from the Institution and placed in the Treasury of the United States, on the same terms as those of the acceptance of the original bequest, never to be expended, and yielding a perpetual interest of six per cent.

"If this petition be granted, all the funds will be permanently and safely invested, and the original income will be increased from 30,000 to nearly 40,000 dollars. Out of this, beside carrying

> to the more important object of the plan, it is proposed to appropriate yearly, a small sum for the gradual completion of the interior of the buildings.
>
> "The great importance of a small addition to the income will be evident, when it is recollected that a definite sum is annually required to defray the necessary expenses of the establishment, and that after this has been provided, every addition will tend to produce a greater proportional amount of useful effect. The proposed increase will be sufficient to pay all the salaries of the officers, and leave the original income in a great measure free to be applied to the objects contemplated in the plan."

This sum of 150,000 dollars having been subsequently added to the original 515,169 dollars, the Smithsonian Institution has now a permanent fund of 665,169 dollars, which, at the rate of interest allowed by the Government, yields an annual income of about £8,000.

The rules now adopted in reference to the distribution of the Publications issued by the Institution, are very liberal.

> "1. They are to be presented to all Learned Societies which publish transactions and give copies of these in exchange to the Institution.
>
> "2. Also, To all Foreign Libraries of the first class, provided they give in exchange their catalogues, or other publications, or an equivalent from their duplicate volumes.
>
> "3. To all Colleges in actual operation in this country; provided they furnish in return, meteorological observations, catalogues of their Libraries and of their students, and all other publications issued by them, relative to their organization and history.
>
> "4. To all States and Territories; provided they give in return copies of all documents published under their authority.
>
> "5. To all incorporated Public Libraries in this country, not included in either of the foregoing classes, now containing more than seven thousand volumes, and to smaller Libraries, where a whole State or large district would be otherwise left unsupplied.
>
> "The author of each memoir receives, as his only compensation, a certain number of copies of it, to distribute among his friends, or to present to individuals who may be occupied in the same line of research. In this way single memoirs are distributed to individuals, and especially to those who are most actively engaged in promoting discoveries. Copies of the reports, and also in some cases, of particular memoirs, are sent to all meteorological observers. Besides these, we have placed on the list the more prominent Academies and Lyceums, as recipients of the minor publications. It is also intended, in order to benefit the public more generally, to place on sale copies of memoirs and reports, though on account of the number required for the supply of Institutions, we have not as yet been able to carry this plan into effect.
>
> "No copyright has been taken for the Smithsonian publications; they are therefore free to be used by the compilers of books, and in this way they are beginning to reach the general reader and to produce a beneficial effect on the public mind."

It is mentioned in Professor Henry's Report for 1852, that the number of copies of the "Smithsonian Contributions" distributed is greater than that of the transactions of any other Scientific or Literary Society.

The Regents of the Institution being of opinion that the rapid interchange of literary and scientific publications is of the utmost importance for the development of knowledge, have constituted themselves the medium for such intercommunications between all Public Scientific and Literary Societies of the Old and New World. For this purpose all important scientific documents issued by the Governments, by the Public Learned and Scientific bodies in the United States, are collected at Washington, and then dispatched to their agents in London, Paris, and Leipsic for distribution; and the agents at the above named places forward to the United States all documents received in exchange; the Smithsonian Institution taking upon itself all cost of transport, so that no delay may be experienced in the receipt of the communications in America. The extent to which this system has been carried, is, I suspect, little known in this country, but may be inferred from the following abstract of the number of Societies in communication with the Institution, and for which parcels are collected.

8	Public	Bodies in	Africa	9	Public	Bodies in	America (South)
10	„	„	Asia	7	„	„	Belgium
4	„	„	Denmark	84	„	„	Great Britain and Ireland
54	„	„	France	69	„	„	Germany
1	„	„	Greece	10	„	„	Holland
1	„	„	Iceland	25	„	„	Italy
4	„	„	Norway	1	„	„	Portugal
12	„	„	Russia	5	„	„	Sweden
4	„	„	Spain	9	„	„	Switzerland
1	„	„	Turkey				

That it may be readily understood how extensive is the agency of the Institution, I give a List of the Institutions in England, Ireland and Scotland, with which it corresponds.

BATH—Bath and West of England Society.
BELFAST—Natural History and Philosophical Society.
Library of Queen's College.
Institution.
BERWICK-UPON-TWEED—Berwickshire Naturalists' Club.
CAMBRIDGE—Cambridge Philosophical Society.
University Library.
Observatory.
CORK—Library of Queen's College.
DUBLIN—Dublin University Philosophical Society.
Royal Irish Academy.
Library of Trinity College.
Royal Dublin Society.
Geological Society.
Botanical Society
Dublin Institute.
EDINBURGH—Royal Society.
Physical Society.
Royal Scottish Society of Arts.
Royal Institution.
Royal Observatory.
Library of Faculty of Advocates.
Society of Antiquaries of Scotland.
University Library.
Wernerian Society of Natural History.
Botanical Society.
GALWAY—Library Queen's College.
GLASGOW—University Library.
Andersonian Institution.
GREENWICH—Royal Observatory.
LONDON—Royal Society.
„ Astronomical Society.
„ Asiatic Society.
„ Geographical Society.
„ Agricultural Society.
„ Institution.
Society of Antiquaries.
Society for the Encouragement of Arts, Manufactures, and Commerce.
Horticultural Society.
Linnean Society.
Geological Society.
Zoological Society.
Entomological Society.
Statistical Society.
Microscopical Society.
Ethnological Society.
LONDON—Archæological Institute of Great Britain and Ireland.
British Archæological Association.
Library of Corporation of City of London.
British Museum.
Library of the House of Commons.
London Institution (Finsbury Circus).
Queen's Library.
Chemical Society.
Board of Admiralty.
Library of the Hon. East India Company.
Meteorological Society.
Library of the Board of Trade.
Library of Eton College.
College of Surgeons.
British Association.
Athenæum Club.
Philological Society.
Museum of Practical Geology.
Aborigines Protection Society.
London Library.
Ordnance Survey.
Institute of Actuaries.
LEEDS—Philosophical and Literary Society.
Historic Society of Lancashire and Cheshire.
LIVERPOOL—Free Public Library.
Observatory.
Royal Institution.
MANCHESTER—Literary and Philosophical Society.
Free Library and Museum.
MAYNOOTH—College Library.
NEWCASTLE-UPON-TYNE—Natural History Society of Northumberland, Durham, and Newcastle-upon-Tyne.
OXFORD—Bodleian Library.
Radcliffe Observatory.
PENZANCE—Royal Geological Society of Cornwall.
———— Royal Cornwall Polytechnic Society.
ST. ANDREWS—University Library.
WOOLWICH—Military Academy.
AUSTRALIA, HOBART TOWN—Royal Society of Van Dieman's Land.

In addition, a few eminent men in this country are honoured by having regularly transmitted to them sets of the publications as collected; and parcels are also received by the Institution and its agents for transmission from distinguished literary and scientific men who may wish to communicate with each other. A sort of literary treaty under the sanction of the Government, has been made, by which these international literary and scientific exchanges are enabled to pass the Customs promptly and free of duty, a great boon to the Societies and individuals who are enabled to avail themselves of the channel. I learn that the London Agent, Mr. Henry Stevens, of Morley's Hotel, Trafalgar Square, London, constantly forwards, free of expense, once or twice in every month, a large case of parcels, being presents to the Smithsonian Institution and other Libraries in the United States, and to individuals;—a parcel mail that is likely, when better known, to be of great use to the students of both countries. It will serve to show the extent to which this system of exchange is already carried, if I append an Abstract of one of the bills of ladings, for which I am indebted to Mr. Stevens.

ACCOUNT of Packages sent by the Smithsonian Institution to its Foreign Correspondents. May, 1853.

COUNTRIES.	Addresses on principal packages.	Addresses enclosed in preceding.	Total.	Number of principal packages.	Packages enclosed from others.	Packages enclosed for others.	Total.	Weight in lbs.	Capacity in cubic feet.	Number of boxes.	Number of letters.	Agent to whom sent.
Sweden	7	7		17	20	9						Dr. J. G. Flügel, U.S. Consul, Leipsic.
Norway	4	1		7	12	1						
Iceland..........	1			2	1							
Denmark	7	4		14	23	5						
Russia	15	6		32	42	7						
Holland	12	3		23	34	4						
Germany	85	58		155	181	63						
Belgium	9	6		18	34	8						
Switzerland	13	5		19	49	6						
Total	153	90	243	287	396	103	786	6,250	200	25	190	
France	55	26		80	102	29						Hector Bossange, Paris.
Italy............	36	13		43	56	15						
Total	91	39	130	123	158	44	325	2,250	72	9	110	
Portugal	1	1		2	6	1						Henry Stevens, Morley's Hotel, London.
Spain	4	2		6	9	2						
United Kingdom..	99	51		163	150	59						
Australia	1			1	1							
Total	105	54	159	172	166	62	400	2,786	90	7	140	
Rest of Old World	17			20	30							Various Persons.
South America ..	16	2		23	18	2						
Total	33	2	35	43	48	2	93	914	30	7	35	
GRAND TOTAL..	382	185	567	625	768	211	1,604	12,220	392	48	475	

Such a system of interchange is, in my opinion, most important, and I hope that before long some similar agency will be organized in this country, either by the Royal Society, as the representative of the Science of the country, or by the Society of Arts, perhaps the more active Society, and which has already commenced on a small scale a somewhat similar undertaking in offering to act as London Agent for the Mechanics' Institutions of the Kingdom.

Under the copyright laws of the United States a copy of each work published, is required to be delivered to the Smithsonian Institution, and one of the rules adopted by the Regents is that a list of the "Books, Musical Compositions, Maps, Prints, &c.," received under this rule, shall be annually printed, thus furnishing a yearly catalogue of publications which, printed in large numbers, finds its way readily into the hands of all who are interested in the subject, and has the further advantage of at once pointing out what books have not been received into the Library. Such an arrangement would I think be advisable in connexion with the British Museum.

LIMITED PARTNERSHIPS.

The subject of special partnerships being one of considerable interest to commercial men, I have thought that it came within my province to collect a few facts on the subject.

By a law of New York, as passed April, 1838, it is set forth, among other points, that—

"I. Limited partnerships, for the transaction of any mercantile, mechanical, or manufacturing business within this state, may be formed by two or more persons, upon the terms, with the rights and powers, and subject to the conditions and liabilities herein prescribed; but the provisions of this title shall not be construed to authorize any such partnership for the purpose of banking or making insurance.

"II. Such partnerships may consist of one or more persons who shall be called general partners, and who shall be jointly and severally responsible as general partners now are by law; and of one or more persons who shall contribute, in actual cash payments, a specific sum as capital, to the common stock, who shall be called special partners, and who shall not be liable for the debts of the partnership, beyond the fund so contributed by him or them to the capital.

"III. The general partners only, shall be authorized to transact business and sign for the partnership, and to bind the same.

"IV. The persons desirous of forming such partnership, shall make and severally sign a certificate, which shall contain—

"1. The name or firm under which such partnership is to be conducted:

"2. The general nature of the business intended to be transacted:

"3. The names of all the general and special partners interested therein, distinguishing which are general and which are special partners, and their respective places of residence:

"4. The amount of capital which each special partner shall have contributed to the common stock:

"5. The period at which the partnership is to commence, and the period at which it will terminate.

"V. The certificate shall be acknowledged by the several persons signing the same, before the chancellor, a justice of the supreme court, a circuit judge, or a judge of the county courts; and such acknowledgment shall be made and certified in the same manner as the acknowledgment of conveyances of land.

"VI. The certificate, so acknowledged and certified, shall be filed in the office of the clerk of the county in which the principal place of business of the partnership shall be situated, and shall also be recorded by him at large in a book to be kept for that purpose, open to public inspection. If the partnership shall have places of business situate in different counties, a transcript of the certificate, and of the acknowledgment thereof, duly certified by the clerk in whose office it shall be filed, under his official seal, shall be filed and recorded in like manner, in the office of the clerk of every such county.

* * * * * *

"IX. The partners shall publish the terms of the partnership when registered, for at least six weeks immediately after such registry, in two newspapers to be designated by the clerk of the county in which such registry shall be made, and to be published in the senate district in which their business shall be carried on; and if such publication be not made, the partnership shall be deemed general.

* * * * * *

"XVII. A special partner may, from time to time, examine into the state and progress of the partnership concerns, and may advise as to their management; but he shall not transact any business on account of the partnership, nor be employed for that purpose, as agent, attorney, or otherwise. If he shall interfere, contrary to these provisions, he shall be deemed a general partner.

"XVIII. The general partners shall be liable to account to each other and to the special partners, for their management of the concern, both in law and equity, as other partners now are, by law.

* * * * * *

"XXIII. In case of the insolvency or bankruptcy of the partnership, no special partner shall, under any circumstances, be allowed to claim as a creditor, until the claims of all the other creditors of the partnership shall be satisfied."

From an examination of the Registry above alluded to, it appears that, from June, 1847, to June, 1853, the Partnerships entered into and the amounts contributed were as follows:

			Dollars.	
Under			1,000	4
Between	1,000	and	2,000	8
,,	2,000	,,	3,000	9
,,	3,000	,,	4,000	8
,,	4,000	,,	5,000	5
,,	5,000	,,	10,000	46
,,	10,000	,,	15,000	66
,,	15,000	,,	20,000	25
,,	20,000	,,	30,000	69
,,	30,000	,,	40,000	18
,,	40,000	,,	50,000	12
,,	50,000	,,	75,000	25
,,	75,000	,,	100,000	8
Above	100,000			9
				312 Special partners.

A more minute investigation of the Registry, brings out the following results, in illustration of the working of the law, from June, 1847, to June, 1853:

	1847–48.	1848–49.	1849–50.	1850–51.	1851–52.	1852–53.	Total.	Average duration of Partnerships in Months.
Auctioneers	..	..	..	1	1	..	2	36
Brokers	1	2	2	..	..	2	7	37
Carpets and furniture ..	1	..	2	1	1	3	8	43
China, glass, &c.	..	..	3	..	1	..	4	51
Commission business ..	..	3	6	5	1	8	23	42
Clothing, hats, boots ..	2	..	4	7	7	10	30	39
Dry goods	11	15	8	10	12	11	67	40
Daguerreotypes	..	..	..	..	1	..	1	60
Drugs, &c.	3	2	1	..	1	3	10	55
Exchange merch. ..	..	..	1	..	1	1	3	35
Fancy goods	1	3	3	4	4	9	24	30
Grocery	4	..	2	4	4	5	19	38
Gutta percha, &c. ..	..	1	1	..	..	..	2	40
Guns, &c.	..	1	..	..	1	..	2	24
Hosiery	2	1	1	..	..	..	4	31
Hardware	2	1	3	4	..	2	12	46
Importers..	..	1	..	2	3	7	13	45
Merchants	..	2	..	4	2	2	10	39
Millinery and straw goods	..	1	..	3	2	5	11	35
Music	..	..	..	..	1	1	2	24
Oil and soap	1	1	..	3	1	5	11	37
Publishers	..	..	1	4	2	6	13	47
Raw produce	1	1	1	..	6	6	15	39
Saddlery and leather ..	1	1	..	..	7	..	9	49
Silk	..	1	1	3	..	2	7	39
Ship chandlers	..	..	1	..	..	2	3	48
	30	36	41	56	59	90	312	

It will be seen, by the preceding table, that the number of Special Partnerships in New York is steadily increasing. The predominant tendency of American society in the present day, is to develop more and more this form of commercial enterprise.

WATER-WORKS.

Amongst the establishments most to be admired in America, are the Water-works. The admirable manner in which all the towns that I have visited, are supplied with a constant flow of water, appears to me to be a subject for great praise, and worthy to be copied in England. In saying thus much, I have no wish to find fault with our own Companies, who undoubtedly do their work on the whole well; but a constant supply is such a desideratum that I have ventured to collect a few data in a statistical Table. The question of cost is not one which ought to stop such a city as London from possessing the advantages which are derived from an unintermitting supply.

The Annual Report of the "Watering Committee" of the City of Philadelphia affords some facts, which may perhaps be of interest.

In the year 1850, the number of inhabitants were 409,353, and the average supply per day appears to have been as follows:

"In the month of January an average of 3,689,939 ale-gallons per day.
„ „ February „ 3,553,098 „ „
„ „ March „ 4,251,820 „ „
„ „ April „ 4,523,499 „ „
„ „ May „ 6,224,786 „ „
„ „ June „ 6,252,155 „ „
„ „ July „ 7,283,406 „ „
„ „ August „ 6,739,227 „ „
„ „ September „ 6,612,077 „ „
„ October „ 6,251,163 „ „
„ November „ 5,652,310 „ „
„ „ December „ 4,778,484 „ „

"The average throughout the whole year being 5,731,744 ale-gallons per day, which was supplied to 19,459 tenants, who pay for the water in the city, and about 3000 families who receive a supply from the public hydrant pumps.

"Together in the City	22,459	tenants
And by private hydrants in Southwark	5,357	„
„ „ Moyamensing	2,776	„
Together	30,592	tenants

"From experiments made during the summer, it is found that the greatest consumption of water takes place between the hours of nine and twelve in the morning and two and four in the afternoon; the minimum supply, between the hours of nine in the morning and six in the evening, being between twelve and one o'clock, during which hour most of the factories and steam-engines are stopped. By an experiment made in May last, the supply of water was found to be 1,272,268 ale-gallons from six o'clock in the evening to six o'clock next morning, and 3,392,522 ale-gallons from six o'clock in the morning to six next evening. The greatest supply is required on Saturday, and the least, of course, on Sunday. The average supply for each of the three days of the week for the months of January and July is given below—namely, Sunday, Thursday, and Saturday—from which it may seem that the supply on Thursday in July exceeded that of Sunday by 2,023,856 gallons. The average supply on the days named in January was Thursday 3,877,278, Saturday 3,967,551, Sunday 3,186,446; in July, Thursday 7,620,371, Sunday 5,596,515, Saturday 8,185,909.

"The supply of water in June last, was—

To the City and lower districts by Fairmount Waterworks	6,252,155
To Spring Garden and Northern Liberties by Schuylkill Works	3,716,666
To Kensington by Kensington	1,546,137
	11,515,137

Equal to $33\frac{56}{100}$ gallons for each individual of the population of the City and districts mentioned.

"There are now in the City 670 fire-plugs, in Southwark 207, and in Moyamensing 138, together 1015; being one fire-plug to every 26 houses. In the City there are 276 hydrant pumps.

"The perfect success of this wheel (the Turbine) affords the means of increasing the power of the works at Fairmount (by substituting "Turbines" for the breast-wheels now in use) to the extent of from four and a-half to six million of gallons per day.

"The following Table exhibits the consumption of water, &c., &c., during the past year:—

MONTHS.	Total quantity of water pumped.	Average quantity pumped each day.	Total number of hours the eight old wheels worked in one month.	Average number of hours each wheel worked per day.	Total number of hours the Turbine wheel ran.	Average daily work of the Turbine.	Hottest day in the month.	State of thermometer.	Coldest day in the month.	State of thermometer.	Average temperature of the month.	Quantity of water pumped on the hottest day in the month.	Quantity of water pumped on the coldest day in the month.
January ..	114,388,110	3,689,939	1,846	7·41	..	..	Thursd. 29	44°	Thurs. 20	Zero.	27·5	4,415,760	3,986,450
February ..	103,039,860	3,553,098	1,680	7·21	..	..	Sund. 8	43°	Thursd. 19	16°	34·0	3,281,155	3,041,835
March ..	131,806,435	4,251,820	2,122	8·55	32	..	Saturd. 13	63°	Wednesd. 3	31°	40·7	6,316,990	3,557,140
April ..	135,704,994	4,523,499	1,831	7·63	384½	12·81	Mond. 26	61°	Mond. 5	34°	46·6	No pumping.	3,011,170
May ..	192,968,380	6,224,786	2,424	9·77	625½	20·17	Tuesd. 25	79°	Saturd. 1	56°	63·3	Do.	No pumping.
June ..	187,564,650	6,252,155	2,509	10·45	437	14·53	Wednesd. 16	89°	Frid. 11	60°	71·8	8,500,305	6,373,980
July ..	225,847,585	7,283,406	3,165½	12·76	485	15·64	Thurs. 1	88°	Saturd. 17	68°	77·0	7,310,675	7,089,060 S
August ..	208,916,032	6,739,227	2,960½	11·93	407	13·13	Sund. 15	83°	Wednesd. 4	67°	72·2	5,385,740	5,363,550 W
September	198,362,326	6,612,077	2,680½	11·16	415	13·83	Thursd. 2	79°	Thursd. 30	60°	64·8	8,019,450	5,770,465
October ..	193,786,050	6,251,163	2,704½	10·90	409½	13·20	Frid. 8	76°	Wednesd. 20	52°	58·2	7,808,275	5,388,565
November	151,569,325	5,052,310	2,090	8·7	343	11·63	Tues. 2	59°	Mond. 22	34°	43·2	6,588,635	4,910,535
December ..	148,132,943	4,778,482	1,977	7·96	399	12·87	Tues. 7	54°	Wednesd. 22	26°	41·9	5,644,325	4,206,554
TOTALS ..	2,092,086,690	5,731,744	27,990	9·$\frac{58}{100}$	3,937½	14·$\frac{21}{100}$							

"The average consumption throughout the whole year was equal to 187 ale-gallons each water tenant; $30\frac{6}{10}$ gallons for each individual of the population of the City and districts supplied from Fairmount.

" The average supply in the month of July equalled 238 gallons per water tenant; $38\frac{9}{10}$ gallons for each individual of the population; 271 gallons for each house.

" By the late census it appears that there are—

In the City proper	16,274 houses
In Southwark	6,451 „
In Moyamensing	4,096 „
Together	26,821 houses

" There are now upon the books of the Fairmount Works—

In the City	19,459 water tenants
In Sonthwark	5,357 „ „
In Moyamensing	2,776 „ „
Together	27,592 water tenants

who pay for a supply of water. The amount of water-rents paid into the City by the above tenants, in 1852, was $151,323,05; equal to an average rent of $$5\frac{48}{100}$ for each water tenant.

" The total cost of all the works, from the first old Steam Works at Centre Square, commenced March 1799, with the yearly expenditure added to December 31st, 1852, has been $3,247,894,04

"Cost of Centre Square Works, with yearly expenses added, from March 1799 to September 7, 1815, when steam was started at Fairmount ..	$657,398,91
"Cost of steam works at Fairmount, with yearly expenses added, from August 1812 to July 1, 1822, when the water-power works were started	809,318,04
"Cost of water-power works, from July 1, 1822, with yearly expenses added, to December 31, 1851	1,781,177,09
	$3,247,894,04

" The above cost includes cost of the old wooden logs, of which about thirteen miles were laid, all the iron pipes and mains, and in fact all expenses belonging to the works mentioned above, up to December 31, 1852."

I have gone into this detail in reference to the supply for Philadelphia, but so far as I was enabled to judge, the same system was adopted, or about to be adopted, in every town in the States. At Boston, the Cochituatate Water-works had cost up to the 1st of January, 1853; 5,375,818 dollars, or about £1,100,000, and the supply, in 1852, gave an average of about 58 gallons per head daily. At Washington, arrangements are now being made, and, owing to the kindness of Captain Meigs, I am enabled to say that the cost is estimated at nearly £500,000. The amount of water that *can* be supplied, is to be 36,015,400 gallons daily. Such are some of the facts in connection with the large towns; but towns of only a few thousand inhabitants are equally well provided. Lancaster with under 5,000 inhabitants, is in proportion as as well supplied as New York.

ON FIRES.

It is impossible for a visitor to be many days in the United States, without his attention being drawn to the fires which are of such frequent occurrence, and to their serious character. The causes generally I need not indicate; but one it may perhaps be as well to advert to, as it is now I observe being introduced into this country. I allude to the size and height of shops and warehouses. If a fire once takes hold of buildings of very great size and height, no fire brigade, however complete, can save the building, or even portions of the surrounding property.

I have not thought it necessary to give the rates paid for insurance, as these of course vary much in towns where timber is more or less used in the erection of buildings, but it may be as well to state that in Philadelphia there is a system of Perpetual Insurance. In consideration of the payment of two per cent, the Company insure for ever any house, the insurance expiring only when the house is burnt down; of course the value of this plan depends on the permanent stability of the Company.

The steps taken for extinguishing fires, are however of interest to the inhabitants of all large towns. Inquiry has led me to the belief that the system adopted in America, though perhaps suitable for the people of the United

States, could not with advantage be introduced into England. I am of opinion that the plan carried into effect by the private Insurance Companies in London, under the superintendence of Mr. Braidwood, is the best for us. At the same time I venture to suggest, whether one or two arrangements might not be copied by them with advantage.

In the first place, the number of Fire-stations in London appears to me to be insufficient in proportion to the extent of London and its suburbs; and the means of communicating information in case of fire to the engine-superintendents, wants arrangement and certainty. We have in London, Westminster, and Southwark, only 19 engine-stations, where the arrangements are complete, each engine fully manned, and capable of being brought out in a few minutes; and in addition we have the Government engines of Greenwich, Woolwich, and Deptford, and about 130 parish engines, which latter, however, are too often of little use from being in want of repair, and when fit for operation are generally too small to be of much service, added to which the working of them depends on their finding assistants at the moment required; 19 completely officered engine stations to 2,500,000 inhabitants is at the rate of one establishment to about 130,000 people, and, as London has 380,000 houses, it follows that each completely officered establishment has to take charge of about 20,000 houses. In New York, with about 600,000 persons on the island, not including Brooklyn, Hoboken, Staten Island, &c., there are I believe 49 engine establishments and 54 hose reels, each fully manned.

In addition there are a few of what are called Hook and Ladder Companies, and most of the engine establishments have hose reels, and in consequence of the constant supply of water in New York, Philadelphia, and Boston, there are in Philadelphia 920 fire-hydrants, and in Boston 1158.

At Boston and at New Orleans, they have introduced electric telegraph communication between the different engine stations. The advantages to be derived from such rapid communication is obvious. I would merely suggest that in London the wires from each station should communicate to the head-office only and the announcement of a fire should thence be dispatched to the branch-offices. The advantage of communicating direct with the head-office, would be the ensuring the presence of the chief of the department at the earliest moment to guide the arrangements, and the time lost would be merely momentary in an establishment always on the watch. If the police should ultimately avail themselves of the telegraph, as I presume they will do, then of course greater benefits would be derived from the increased number of stations, from which fires would be announced. In America each Fire-brigade has an officer appointed to attend its movements with a speaking-trumpet.

The fire arrangements at Richmond in Virginia are considered the most efficient. The eight fire companies are not as in other cities independent; but are under the order of a "Principal Engineer" who, when a fire takes place, is alone authorized to give the necessary directions. Each fireman is obliged to hold shares in the Richmond Fire Association, who effect insurances on property and lives, thus making it the interest of every member to extinguish the fire quickly. Attached to each company is a band of about 20 coloured men (slaves), who do the most laborious part of the work, and who, if their services meet with the approbation of the Principal Engineer, each receive 4 dollars yearly, irrespective of the number of fires which may occur. Amongst the documents I have handed in to the Government, will be found three copies of the By-laws of the Richmond Fire Association, and of their reports for the last three years, which I believe will be found interesting as exhibiting the operation of an experiment new in the United States.

I understand that at Lynchburg the Fire Companies are under a somewhat similar arrangement, but as far as I can ascertain, this plan has not been adopted in any other city of the United States.

It appears that two years ago the State Government of Virginia passed a law, that in every town where Volunteer Fire Companies were hereafter formed, they should select from their number a Chief Engineer, to take the command and prevent confusion resulting from counter-orders. In Norfolk, Virginia, the Fire Companies have been organized in accordance with this enactment.

In New York, besides the Engine and Hose Companies, there are the Hydrant Companies, whose duty it is to take charge of the hydrants at fires.

As an account of the actual working of some of the engines of the principal Fire Companies may be of interest, I have extracted the following from the Report of the New York Herald on the "Fireman's Tournament," which took place at Newhaven, on the 23rd of July, 1853.

A pole, 150 feet high, was erected in The Park, and from the top, at a distance of two feet apart, were nailed slips of wood, serving as indicators of the height to which the competing engines threw the water. Twenty-one engines, divided into two classes, according to the size of their cylinder and their calibre, entered for the prizes. The following table shows the height to which each engine threw the water, and the number of firemen attached.

FIRST CLASS.

No.	Name of Engine.	Men.	Height of Stream. Feet.
1.	Rhode Island of New London	54	133
2.	Naumkeag Ko. 6, of New London	65	125
3.	Southwork No. 38, of New York	80	121
4.	Gaspee, of Providence	44	143
5.	Quinnipiack No. 1, of East Haven	64	129
6.	Red Jacket No. 10, of Williamsburg	48	113
7.	Empire No. 9, of Fair Haven	52	137

SECOND CLASS.

No.	Name of Engine.	Men.	Height of Stream. Feet.
1.	Pacific No. 2, of Middletown	45	135
2.	Collinsville No. 1, of Collinsville	79	141
3.	Excelsior No. 5, of Bridgeport	60	91
4.	Niagara No. 3, of New London	49	111
5.	Niagara No. 1, of Springfield	60	120
6.	Relief No. 1, of New London	55	137
7.	Niagara No. 1, of New Britain	51	149
8.	Annihilator No. 5, of Hartford	80	129
9.	Phenix No. 1, of Waterbury	72	127
10.	Protection No. 2, of Waterbury	66	129
11.	Cataract No. 1, of Meriden	40	103
12.	Empire No. 5, of Bridgeport	58	129
13.	Neptune No. 2, of Hartford	58	143
14.	Torrent No. 2, of Chickopee	46	127

In the first contest, the Gaspee, of Providence, threw the water to the height of 143 feet, and carried off the prize; but it was afterwards ascertained that, by some misapprehension, the New York Engine had played through hose, 504 feet long, while that which was attached to the Gaspee, did not exceed 375 feet in length.

STEAM FIRE ENGINE.

Having heard much in praise of a Steam Fire-Engine lately built at Cincinnati, and Professor Wilson being anxious to visit that district to make inquiries in connexion with certain large manufactories, we thought it advisable that an examination of its capabilities should be made, and accordingly arranged to visit Cincinnati together.

We there learned that the engine had been constructed in consequence of the jealousies existing between the various Fire Brigade Companies—a jealousy which in Cincinnati as in other towns of the United States had led to constant quarrels and riots. The Town Council consulted Mr. Miles Greenwood, an eminent iron manufacturer, and decided on having a Steam Fire Engine built upon a principle suggested by Mr. A. B. Latter; Mr. Greenwood volunteering to accept the office of Town Engineer without remuneration, if the Council would invest him with sufficient power to act against any combination which had been threatened so soon as it was known that there was a probability of a Steam Fire Engine being constructed. This power was at once granted.

On reaching the fire-engine station we were informed that it could only be seen in operation by an order from Mr. Greenwood, to whom we proceeded, and on making known our wishes, Mr. Greenwood not only at once furnished us with every information but accompanied us to the station.

The engine, which burns bituminous coal, cost 11,000 dollars (about £2,300); but it is assumed that others would not cost more than 8,000. It weighs between five and six tons; is supported on three broad wheels, so as to turn readily in the streets; and throws 2,000 barrels (ale) per hour, that is about 84,000 gallons. For facilitating the working of the engine, supply cisterns have been connected with the water-mains at the angles of every other block of houses, that is about every 400 feet; these cisterns contain about 2,000 gallons each.

The staff under Mr. Greenwood's directions are—

2 Firemen } One as a reserve in case of accident.
2 Drivers }
1 Captain.
1 Lieutenant.
15 Men.

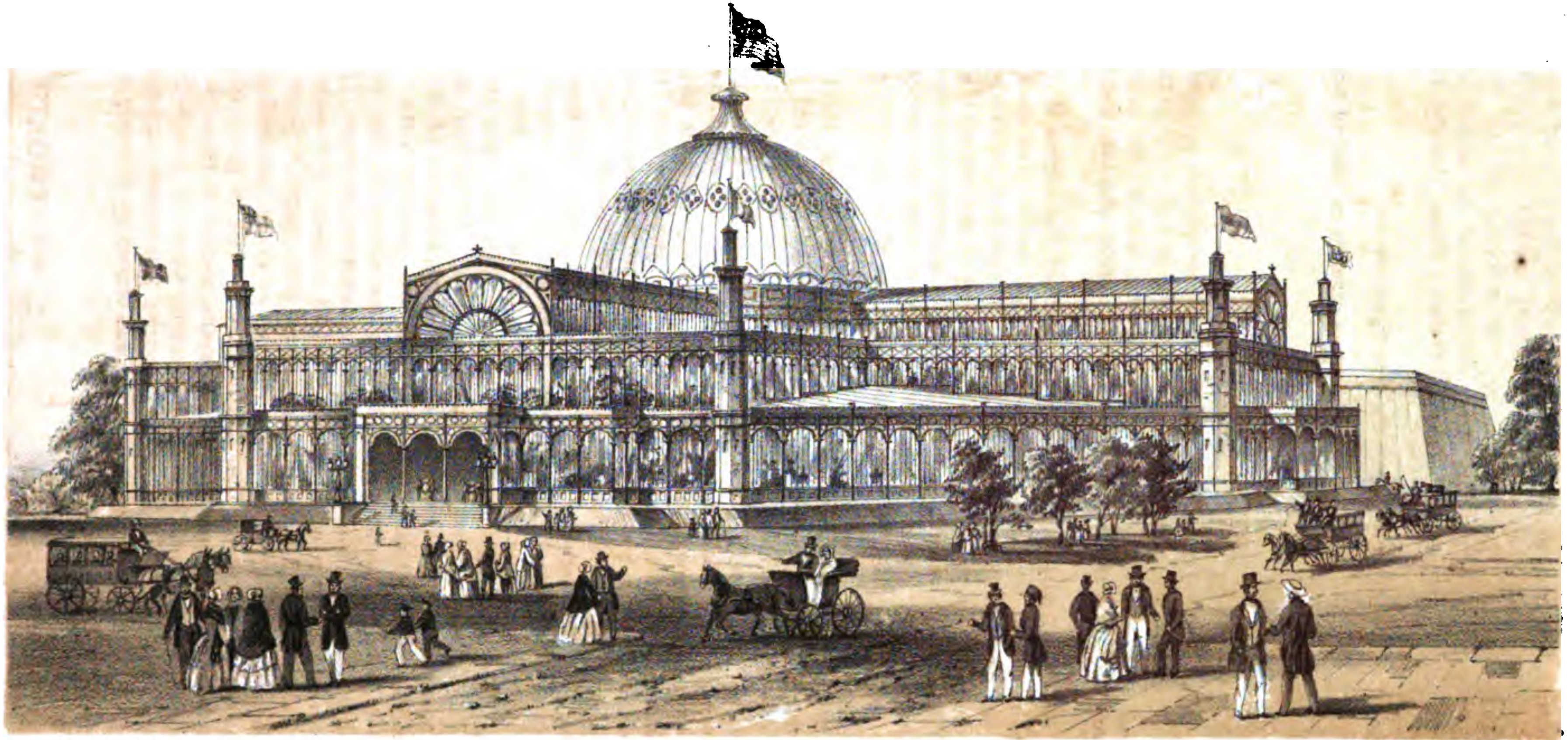
The arrangement in regard to working the engine is, that it can either play one, two, four or six streams. If all six are in full work at the same time, they then consist of two jets of three inches, and four of two inches and a half. Five horses are required,—four to draw the engine, and one the fuel and reel cart.

The principle adopted in the construction of the engine is, that the water is heated in a coil of pipe, and where the fire first strikes upon the pipe, the diameter is very small, gradually increasing in size as it becomes more distant from the centre of the heat. In the first process of getting up the steam but a very small supply of water is admitted, which is added to from time to time by a hand pump, until power enough is obtained to work the self-feeding pump. When in operation, seven pumps are used so as to prevent stoppage from accidents.

On reaching the station we satisfied ourselves that there was no fire in the engine, and that the water in the boiler was cold. On the order being given to proceed to a particular point, the light was applied to the grate, always kept ready filled with very combustible materials, the horses were harnessed, and the engine left the house in three minutes and a half after the supposed fire was announced. It reached the spot indicated, 1,450 feet distant from the engine-house, in two minutes and three-quarters, and in six minutes and a half from the first announcement, the horses were uncoupled and the engine placed over the supply cistern. In eight minutes and a half the steam-guage was at 35°, and the pumps self-feeding. In nine minutes a hose was affixed, and the reel dispatched in nine minutes and a half to about 100 feet distant from the engine, during which time a second hose was being fixed and laid out. In twelve minutes water was issuing from one hose, and in twelve minutes and a half from both. In thirteen minutes the jet of water reached 100 feet from the nozzle first applied, one of an inch diameter, and from that time a large body of water was pouring forth. In seventeen minutes the supply was strong enough to rise about 60 feet in height. In twenty-eight minutes it was playing over a moderate-size house. In thirty-three minutes all six nozzles were in use. In 38 minutes the issue of water was stopped that the capability of supplying steam jets might be shown. In thirty-nine minutes and a half a very powerful blast of steam was issuing.

We were informed that the Engine had on two or three occasions played six hours continuously, and once twelve hours, and we were given to understand that it had thrown water 230 feet, a statement we could believe from the power exhibited, and which was shown by directing the stream against a heavy cart standing empty in the street, and which was driven by it nearly a hundred feet.

C. WENTWORTH DILKE.

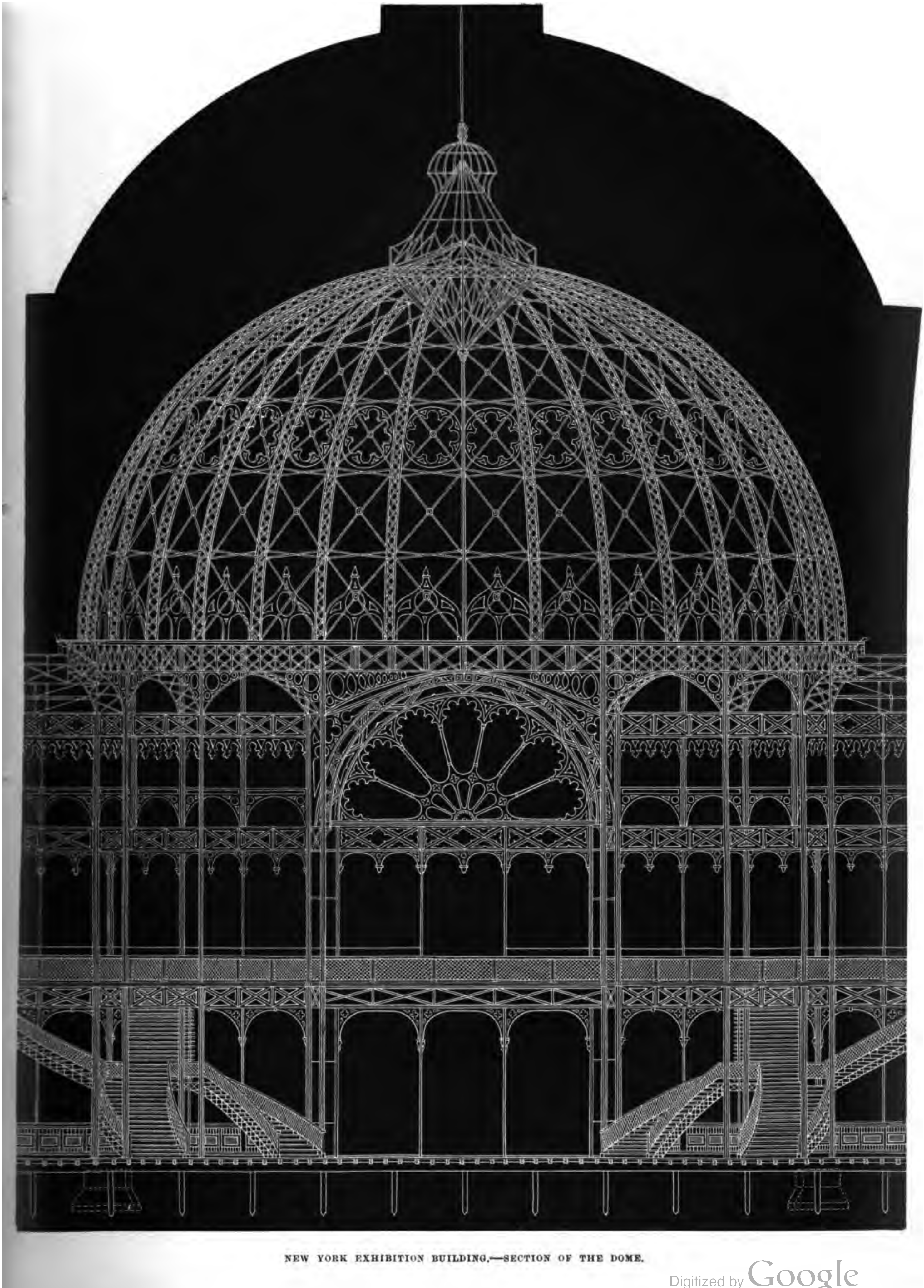


Harrison & Sons lith.

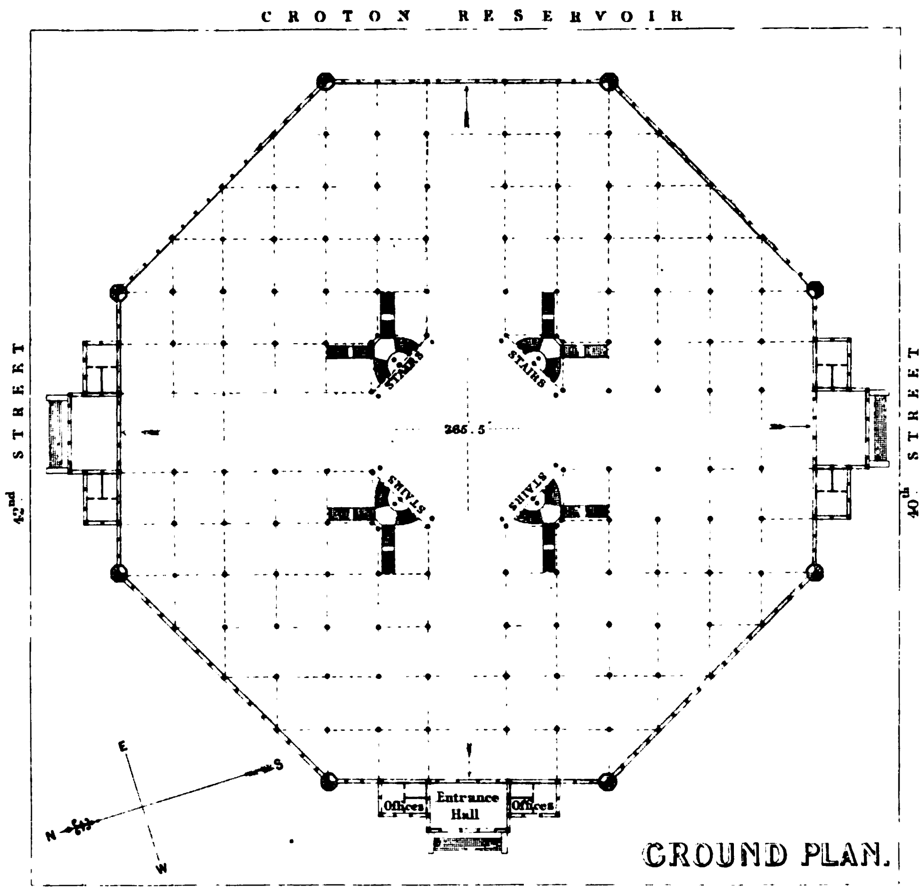
45, St Martins Lane, London.

NEW YORK EXHIBITION BUILDING.

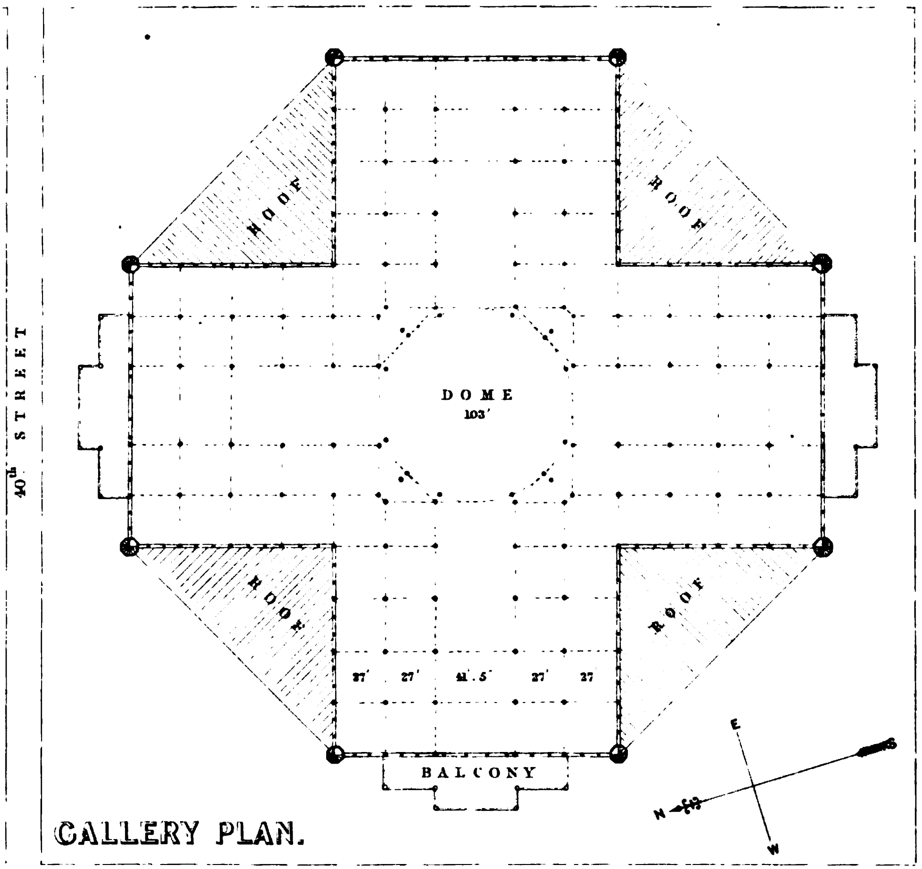
FROM A DESIGN OF MESSRS CARSTENSEN AND GILDEMEISTER.



NEW YORK EXHIBITION BUILDING.—SECTION OF THE DOME.



GROUND PLAN.



GALLERY PLAN.

Scale, 100 feet to 1 inch.

The Ground Floor is a regular Octagon, 365 feet 5 inches in diameter. This measurement does not include the three Entrance Halls each of which projecting 27 feet is 40 feet 5 inches wide. On each side of these Entrances Offices are attached projecting 18 feet from the main Building and being 27 feet in width.

The Interior consists of four great Divisions, each having a Main Avenue, with side Aisles which are connected on the ground floor by four triangular sections. These Main Avenues unite at the Dome and together form a Greek Cross, which shape is preserved in the Gallery Floor. The Materials used in the construction are chiefly Iron and Glass.

DIMENSIONS.

Diameter of Dome 103 feet.
Height of Dome from floor to skylight 122 feet.
Height of Avenues in the clear 67 feet.
Height of First Story in the clear 24 feet.
Height of Second Story in the clear 21 feet.
Height of Aisles, total 45 feet.

Width of Aisles 54 feet.
Height of Triangular Sections 24 feet.
Height of Substructures varying from 8 inches to 8 feet 4 inches.
Width of Avenues 41 feet 5 inches.
Width of Galleries 54 feet.
Width of each Front 149 feet 5 inches.

Diameter of each of the eight octagonal Towers 8 feet.
Height of Towers above side Walk 75 feet.
Area of principal Floor 111,200 square feet.
Area of Entrances, Halls and Offices 6,000 square feet.
Area of Galleries 62,000 square feet.

Harrison & Son, 45 St Martins Lane

NEW YORK INDUSTRIAL EXHIBITION.

Special Report of Mr. DILKE.

Presented to the House of Lords by Command of Her Majesty. 1854.

LONDON:
PRINTED BY HARRISON AND SONS.

NEW YORK INDUSTRIAL EXHIBITION.

SPECIAL REPORT

OF

PROFESSOR WILSON.

Presented to the House of Commons by Command of Her Majesty,
in pursuance of their address of February 6th, 1854.

[1830]

LONDON:
HARRISON AND SONS, ST. MARTIN'S LANE.
1854.

RETURN to an Address of the Honourable the House of Commons, dated February 6, 1854;
for—

"Copies of the Reports made to the Foreign Office, or to any other Department, by the Commissioners appointed to attend the Exhibition of Industry in the City of New York."

PROFESSOR WILSON'S SPECIAL REPORT.

FROM the statement given in the General Report, it will be seen that the portion of the duties of the Commission confided to my charge comprised those classes having reference to "Raw Materials," and the industries immediately connected with them. To these were added the examination of the machines and implements used in Agriculture, and of certain branches of manufacture in which chemical principles were directly involved.

The vast territorial area of the country visited; the richness and extent of its mineral deposits; the variety and importance of its vegetable productions, and the ready and rapid manner in which these raw materials are utilized and new and important industries established, invested their examination with deep interest, and at the same time with a responsibility which I felt it to be impossible to fulfil as I could wish in the short period allowed for the duty. In the prosecution of my inquiries, as well as in the examination of the raw materials themselves, and of the various industries connected with them, I have to express my sense of the great assistance that was rendered me, and the extreme liberality and attention which (save in a rare instance or two) I met with from all to whom I applied for any information. In many cases, indeed, the whole interest of the inquiry seemed to be transferred to those of whom I had only ventured to ask for special details.

As many of these details, now collected together for the first time, involve points of some importance to the productive industry of the States, and consequently have a broader bearing upon the interests of her citizens than upon our own; and as the value of such information depends materially upon the reliability of the sources whence it is obtained, I feel it to be a duty no less than a pleasure to acknowledge the assistance I received from the following gentlemen, whose names will I am sure be received as a guarantee for the matter I have been enabled to glean.

From Professor H. D. Rogers and Professor Jas. Hall, I received much valuable information respecting the mineral produce and economic geology of the States generally, while, in reference to the lead industry, Mr. Benjamin Tatham of New York, and Mr. C. M. Wheatley of Phœnixville, gave me great assistance, and Dr. C. G. Hussey of Pittsburg, and Mr. J. Davis, jun., of Boston, aided me materially in procuring the details of the present state of the copper industry. To Mr. C. E. Detmold I am indebted, not more for the special information in reference to zinc than for the assistance he gave me respecting other industries with which he was well acquainted. At the United States' Mint I met with every facility for seeing the establishment and the principal departments in practical operation, while the Chief Coiner and the Refiner were good enough to furnish me with the working details of their respective departments.

But the most important of all the mineral industries, certainly as far as commercial relations with this country are concerned, is the iron industry,—and to this my attention was specially directed. The valuable information I received from Mr. A. S. Hewitt of New York, and from Mr. C. E. Smith of Philadelphia, and the many advantages I derived from the interest which Mr. Hewitt more particularly took in the inquiry, have enabled me to carry the account of this important branch of industry up to the present time. From Mr. Fraley, the President of the Schuylkill Navigation Company, and rom the other coal carrying companies I readily obtained full information respecting the production of that essential material; while Mr. Cresson of Philadelphia very liberally furnished me with the engineering plans and working details of the large establishment under his charge, and with general information on the manufacture and consumption of gas in the United States. From Professor Benjamin Silliman, who was charged with the supervision of the "Raw Material" section of the Exhibition, I received at all times every assistance in his power; his extensive acquaintance, both with the various processes of manufacture and with the manufacturers themselves, rendered his co-operation always valuable. To his assistants, Mr. G. Brush, in Class I; Dr. H. Wurtz, in Class II; and Dr. J. Bryant Smith, in Classes III and IV, I am also much indebted for the aid they afforded me in the examination of their respective classes.

In the following details I have endeavoured, in accordance with the instructions I received, to follow as far as practicable the classification and arrangements adopted in the Jury Reports of 1851.

INTRODUCTION TO ECONOMIC GEOLOGY.

A close relation exists between the geology of a country and the industrial pursuits of its inhabitants. In our own country this is sufficiently marked. If we visit a district occupied by the tertiary or secondary formations, we find it chiefly inhabited by people engaged in agricultural pursuits, either in the raising of corn or the rearing of animals, according to the description of soil; the manufacture of bricks and rough pottery, with the quarrying of building and other stones being commonly the only economic applications of which the soil is susceptible. Exceptions to this, however, exist; for instance, large deposits of iron ores have recently been identified in the oolite, which will, probably, owing to their proximity to mineral fuel, ere long be the seat of an industry that formerly existed in, but has now altogether passed away from the Green-sand district. In the Triassic series, the uppermost beds contain extensive deposits of common salt. The existence of these has determined the location of an industry peculiar to the district, and which, in their absence, exists nowhere else in the country. Descending in the scale of time, I need only mention the carboniferous formations, the origin and support of those vast and important industries—the coal and the iron trade; and, still more remote in point of geological age, we find the metamorphic and the igneous rocks giving up their mineral stores, and furnishing occupation to the inhabitants of the surface area in drawing them forth from their natural depositories, and in rendering them more directly subservient to the uses of man. These relations between the soil and its occupants are more marked in an old country than in a new one, because they are necessarily more developed and more advanced.

In the United States the same conditions exist. There the connection may be traced well nigh to its birth. In a new country the early settlements are generally determined by their agricultural suitability, the supplies of the necessaries of life being of course the first consideration. The geological conditions which render a district adapted for the purposes of agriculture are generally such as experience has shewn us are not consistent with the existence of mineral wealth. The former needs for its successful development, conditions, both chemical and physical, which are most readily furnished by the easily decomposing sedimentary rocks of the secondary and tertiary formations; while the latter is met with imbedded in rocks of anterior date, whose composition is different, and whose forms have been more or less altered by the action of internal heat. These rocks, when they appear at the surface,—and large tracts in the States as well as in our own country are covered by them,—present a cheerless prospect to the follower of agriculture; time has not made its marks so deeply on them as on those he has been more used to devote his energies to; the bare and well-rounded surfaces tell him that the two great agents of disintegration,—air and moisture,—have been able to effect but little here; and that, even in the districts formed from their debris, the surface soil will be both scanty and poor in fertilizing constituents.

But in those districts the riches which are denied to the tiller of the surface are frequently freely bestowed on those who seek their harvest from beneath. This, while it lasts, offers more inducements for labour; its gains are greater; its very uncertainty gives a zest to the adventure which the plodding operations of the surface cannot possess, and these are too generally left either totally unheeded or else to the vicarious attentions of an inferior class of labour.

Although our knowledge is sufficiently advanced to point out the relations which any particular district has to the possession of mineral wealth, as well as to agricultural capabilities, still the evidence afforded by the United States in the occupation of its more recently acquired possessions shews clearly that agriculture was the inducement that led the wanderers thither, and that, in most cases, the existence of their mineral wealth has been made known by accidental circumstances; and even now its development remains quite as a secondary consideration.

In such a vast extent of country we can hardly expect to find that the surveys undertaken by the Governments of the respective States have been very accurate or defined in their details; a good general idea of the physical geography and geology of the country has been obtained, while the knowledge, gained in reference to districts possessing special mineral features, has resulted chiefly from private investigations which, when conducted by competent and reliable men, have been valuable contributions to applied science, yet, in some cases, have been so tinctured with interested motives as to deprive them of much of their value.

The general physical character of the country is very distinctly marked; a range of mountainous land traverses the extent of the Union, from its north-eastern limits in the State of Maine to its south-western extremity in Texas. The New England States are principally occupied by disturbed portions of this range, which, in some instances, as in Vermont, rises to an altitude of 6,000 feet. The area, lying east of this mountain-chain between it and the Atlantic seaboard, is occupied by formations of the secondary and tertiary series, while the older formations are developed to a vast extent in the area on the western side.

All of these possess certain economic features, and from most of them some representative specimens were exhibited in Class I. The following brief sketch will give some idea of their range and more important produce.

The *Tertiary* beds cover an extensive area in the northern and eastern parts of the States, occupying the valleys of the St. Lawrence and of Lake Champlain, and spreading over a great portion of the surface between the great mountain chain and the coast line. They then stretch southward and westward, spreading over the south part of Georgia, Alabama, Mississippi, and including a large portion of Louisiana and of Texas. On the western side of the mountain chain the alluvium and drift cover up a large portion of the older formations, of whose characters they largely partake.

The alluvium and drift formed from the disintegration of the metamorphic rocks in North Carolina, Virginia, and Georgia, contain the gold which has recently been obtained in considerable quantities from those States, and specimens of which were sent to the Crystal Palace. In Wisconsin irregular masses of metallic copper have been found. In the north-eastern States, especially in Rhode Island, peat is obtained in considerable quantities. Clays and sands for plastic and other purposes are met with very generally throughout the whole area occupied by this formation. In Wisconsin the Milwaukie bricks made from these clays are well known and much sought after. Iron ores, chiefly bog ore is met with in the alluvium and in a clay band of a peculiar character, which stretches from the St. Lawrence southward to Alabama, extensive deposits of brown hæmatite are found, generally lying at the base of the mountain range. The first-named ores are rarely used;* the latter were the first that were worked, and still furnish a large supply to the blast furnaces. These were shown in the iron series contributed from the States of Vermont, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, and Maryland, in all of which they are largely used.

With this hydrated hæmatite manganese occurs in several localities; in some it is economically worked. Fossil fuel occurs in Vermont, at Brandon, in the shape of a bed of brown coal (lignite), which is there used for smelting purposes. This was exhibited in the Brandon iron series. Along the western base line of the Green Mountain range a bed of clay exists suitable for porcelain purposes. This is met with also, forming a broad band, in New Jersey, and traversing nearly the entire breadth of the State. It is used extensively at the potteries in Jersey City, and elsewhere.

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* See Appendix B and D.

Agricultural Characters—Some of the most recent deposits of this geological division produce soils of high agricultural value, which furnish a large proportion of the finest quality of wheat grown in the States. Along the broad valley of the St. Lawrence, and the Genessee, and other rivers running into Lake Ontario, soils of this character may be seen; while the quantity of their produce is well known even in the markets of this country. In the West, the rank luxuriance of the prairie farms gives everywhere ample indications of the fertility of the soils; and in the Southern States of South Carolina, Georgia, Florida, Louisiana, Mississippi, and Texas, the great richness of these soils renders them suitable for the peculiar agriculture of that region,—the staple produce of which is cotton, rice, and sugar.

Cretaceous.—The Cretaceous system is first seen occurring to a considerable extent in New Jersey and Delaware. It also occupies a considerable area in Virginia and in North and South Carolina, and may be followed stretching across the northern part of Georgia and the centre portion of the States of Alabama and Missouri. It then appears to a smaller extent in Arkansas and expands to a considerable width in Texas. The upper beds appear to be entirely absent, the area described being occupied by the lower calcareous beds, and by the green sand formation. This latter contains, in the State of New Jersey, a large per centage of potash, which gives a highly fertilizing property to the soils formed from it. In the eastern portions of this formation large tracts of light sandy soil exist. These, when mixed with the calcareous beds or clays produce excellent soils. On the western side of the mountain range a large extent of country is covered with beds belonging to this system, which are generally very sterile, and are known by the name of the "Mauvaises Terres."

Lime is the only economic produce obtained from the formation; the flints, characteristic of the uppermost beds, and used in the manufacture of porcelain and the finer pottery, are obtained from this country.

Agricultural Characters.—The soils formed from the different beds of this system are generally of a lighter character than those of the Tertiaries. The markets of New York and Philadelphia are chiefly supplied from the garden farmers of New Jersey and Delaware; and in Virginia and North Carolina, tobacco is cultivated extensively.

Jurassic.—The Jurassic system is not very largely developed in the United States. In Virginia, west of Richmond, it occupies a belt of about 50 miles long by 12 wide, and is there known as the Chesterfield Basin. In North Carolina it occurs again, forming the Deep River basin, and stretches with some interruptions nearly across the entire width of the State. These, it is generally admitted, are portions of the same formation.

This system possesses peculiar economic features, as it contains an important and extensive bed of coal, which is worked to a considerable extent at Richmond, and also, but to a smaller extent, at Deep River. The formation (oolite) in which the coal is found has a thickness of 800 feet, but the coal seams are confined to the lower 150 feet. In some places two or three seams are known to exist, but in the Virginia Basin, south of James River, the various seams are united into one great seam of from 20 to 40 feet thick. The quantity of coal worked is about 150,000 tons annually. The coal in the Deep River Basin has not been very accurately investigated. At present it is not worked to any extent as no means of transportation exist. A slack-water navigation is now in progress which will afford an opening for the produce to the consuming markets.

Besides the coal the only produce of any economic value is stones suitable for building and for grinding purposes. These latter are obtained from the lower beds, which rest on a floor of primitive rocks of a gneissoid or granitic character, and from which they appear to have obtained the silicious grit which gives them their grinding qualities. The building stones come from the upper beds, which are micaceous in character, and are said to work easily and stand the weather well.

The soils are generally good. Along the James River Valley some excellent wheat soils are met with.

Triassic.—The Triassic is first met occurring in Massachusetts, and then is seen occupying the valley of the Connecticut River and a portion of the valley of the Hudson;—thence it passes southward through the States of New Jersey and Pennsylvania, occurring to a small extent in Maryland, and occupying a more extended area in Virginia and North Carolina.

The economic produce of this formation is very important. In most of the Atlantic cities, but especially in New York, a reddish coloured micaceous stone is being used for building purposes to a very large extent. This is quarried chiefly in the States of Connecticut, New York, and New Jersey, the former furnishing the best description of stone. The beds containing this stone have hitherto been considered as belonging to this group, though recently considerable doubts have been entertained as to the correctness of this arrangement, and evidence has been adduced in favour of their belonging rather to the oolitic period. Specimens of the building stone were exhibited from several different localities.

The metallic minerals are found distributed pretty generally through the district where these beds occur. In Connecticut and in New Jersey, copper and lead ores are both met with in several localities; in the former copper is worked to a small extent. In New Jersey nothing has yet been done on a commercial scale, as they seem to occur rather in pockets irregularly dispersed throughout the more fissile beds, than in distinct lodes. The ores are rich, chiefly carbonates,—fine specimens of malachite are met with. In Pennsylvania, lead has been very successfully mined at Phœnixville in Montgomery county, at the point of junction of these beds with the gneissoid rocks. A magnificent series of the rarer mineral specimens from these mines was exhibited by Mr. C. M. Wheatley, who has also commenced operations on a copper vein in the immediate vicinity, which bids fair to be very productive. The mineral veins in the slaty sandstones are observed to be richer in copper than in lead, and the same lode which produces lead in the gneiss, becomes a copper-bearing lode in the superior rock, or the proportion of lead ores become greatly diminished, and the copper ores largely increased.

The only other mineral produce is sulphate of baryta, which is obtained in considerable quantities at Cheshire in Connecticut.

Carboniferous.—The most important member of the carboniferous group is the great coal formation, which possesses from its enormous development, features not less interesting in a geological than in an economic and industrial point of view. In reference to the latter, full details will be seen at page 19 in which I have endeavoured to give the past history and the present condition of this most important branch of industry. In regard to the former a brief sketch must suffice, which will be rendered more complete and intelligible by reference to Sir C. Lyell's Report, page 14.

According to Professor H. D. Rogers, the Eastern or Great Appalachian coal field extends from the northern limits of Pennsylvania to the central part of Alabama, having a length of about 750 miles, and widening out in some places to a breadth of 180 miles. He estimates the entire area at about 63,000 square miles. The Great Western coal field, so far as it has been well identified, occupies the largest portion of the State of Illinois, a considerable portion of Indiana, and a small area of the State of Kentucky.

The late surveys of Dr. D. D. Owen have, however, shown that in Iowa and Missouri this same coal field has a much greater extension than had been previously supposed, which would give reasonable grounds for believing that it occupies even a greater area than the Eastern or Great Appalachian field. The portion lying east of the Mississippi is assumed to be equal to the entire Appalachian field, while that lying west is fully half as much more. Following Dr. Owen's Report, and taking its extreme width from Green River in Kentucky to Des Moines River in Iowa, its range will be seen in that direction, to be between 500 and 600 miles, while in an eastern and western direction, across the States of Illinois and Missouri, its greatest breadth will be fully 400 miles;

and from its northern termination in Iowa to its present fixed southern limits, on the Osage River, its range is more than 300 miles. Still further south in Arkansas, a coal field of considerable extent is known to exist. In Michigan the existence of a large coal deposit has been for some time well known, though hitherto it has been allowed to remain unproductive. In Rhode Island also irregular detached masses of a highly disturbed coal formation are met with and worked economically, though only to a limited extent.

As may be supposed these enormous areas are intersected and traversed by several of the large rivers, such as the Mississippi, the Missouri, the Ohio, Illinois, Wabash, Des Moines, and others, which offer great facilities for transportation to their produce, and open up communication with even the most distant markets.

Some large specimens of the produce of those beds, lying east of the mountain range, were exhibited at New York. One from the Mammoth vein at Wilkesbarre in the Wyoming basin, weighed it was stated 60 tons, and showed a vertical section of the vein by a column of coal five feet square and thirty feet high. From the Schuylkill basin several large samples were sent. The semi-bituminous coals from the Cumberland basin were represented by some blocks of large dimensions. Of the beds of bituminous coal, lying on the west side of the Alleghanies, samples were sent from a few places in Ohio, Kentucky, and Virginia.

Associated with the seams of coal the usual clay iron ores are met with, dispersed pretty generally throughout the formation, and along its edge hæmatite ores are also found. These ores occur more abundantly on the west side of the mountains than on the east, in the latter the clay carbonates are entirely absent from the coal measures. In Tennessee, Alabama, and Western Virginia, they are abundant. Recent surveys have confirmed their existence in the Great Western coal field of Illinois, though at present the iron industry has not been established there. In Missouri enormous deposits of ore have been found, and are already being made available for furnace purposes. Samples of these ores were sent for exhibition from several localities, many of which have been noticed in Class I. Some good idea may be formed of the immense iron producing capabilities of the region occupied by this formation, when we recollect that it covers an area which in the aggregate has been estimated at 160,000 square miles, and that throughout its extent it is probable that with it are associated enormous deposits of iron ores. Another important ingredient towards success is shown in the existence of beds of marine limestone, which occur alternating with the shales and sandstone and seams of coal in almost every portion of the formation. These supply the flux necessary for smelting the clay ores; they also form good and durable building stones, and when burnt are used beneficially for agricultural purposes.

The brine springs occurring in this formation are worked economically in the manufacture of salt. These are met with principally in the western beds of the Great Appalachian field, in Western Pennsylvania, Western Virginia, Ohio, and Kentucky.*

Building stones are also obtained from the beds of sandstones separating the coal; and the fireclay found underlying it supplies materials for bricks, rough pottery, and other plastic purposes.

Mountain Limestone.—This member of the carboniferous series is very irregularly exposed in the United States. It is met with skirting the coal for-

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* In Pennsylvania there are 47 salt works:—

In Alleghany county	10
„ Armstrong county	12
„ Clarion county	1
„ Jefferson county	1
„ Westmoreland county	23

making in the aggregate from 180,000 to 200,000 barrels of salt annually.

In Western Virginia there are 40 establishments in operation:—

In Braxton county..	1
„ Kanawha county	33
„ Smith county	1
„ Washington county	5

making in the aggregate about 3,500,000 to 4,000,000 bushels annually.

In Kentucky there are 11 works in operation, 2 of which are situate in Barren county, and 9 in Clay county, with an average production of between 250,000 and 300,000 bushels per annum.

mation of Pennsylvania in bands of a limited area. In Virginia it assumes a more important character, especially in the southern parts of the State. In Alabama and Tennessee, it skirts the coal measures in a narrow belt on the east and south sides, while on the north and west sides it expands considerably, and occupies a much more extended area. In connection with the Great Western coal field, the extent and importance of this formation are greatly increased. In Michigan the coal measures have not been sufficiently examined to give any very satisfactory evidence in reference to its occurrence there.

The economic produce of this formation does not appear to have assumed at present much importance. Iron ore (hæmatite) is found in a red shaly bed in this formation in Pennsylvania, where it is worked to a limited extent. Lead ores are found in the southern part of Illinois, especially in those localities where the strata are much disturbed, and also in Alabama and Tennessee. Dr. J. G. Norwood, the State Geologist of Illinois, who examined the district, gives a very favourable opinion as to its productive capabilities. Some good building stones were exhibited from this formation, obtained from the neighbourhood of St. Louis. They are easily quarried and worked, and some of them are sufficiently compact and fine grained to take a polish.

Devonian.—This formation, which appears to be of a very heterogeneous character, is composed of fine and coarse deposits; some of the beds assuming the characters of clays and others of shales and sandstones. It occurs to a considerable extent in the State of New York, of which it occupies fully one-half, running south from the Hudson River up to Lake Erie, along whose shore line it may be traced from Buffalo down to Cleaveland in Ohio. It is then seen skirting the west side of the coal measures in a broad belt, gradually thinning out as it proceeds southward; on the east it follows the outline of the coal formation, from Pennsylvania to Alabama. It has been identified belting the Michigan coal field, and forming a band of varying breadth along the edge of the Great Western coal measures. Along the valley of the Mississippi the shales and sandstones are met with at several points, cropping out below the beds of the carboniferous limestone. Within this system the United States geologists include that vast limestone deposit, the remains of an ancient coral reef, which occupies such an enormous area in the Western and South Western States.

The principal economic products consist of sandstone of various characters suitable for the purposes of building, flagging, &c., and of limestones either for building or for burning—some have hydraulic qualities. Iron ores are found in some of the beds. In Pennsylvania and some of the southern districts a fossilliferous iron ore is worked economically for smelting, several specimens of which were exhibited in the different iron series.

Silurian.—The upper beds of this system occur to some extent in the State of New York, in the Helderburg mountain range, near the Hudson River; and also in New Jersey, Pennsylvania, and Virginia, to a more limited extent. In a south-western direction they may be traced in the northern part of Ohio, along the valley of the Sandusky River, through Kentucky and Tennessee, in Michigan, and in the south-east part of Indiana, and the southern part of Wisconsin. The lower beds, consisting of series of argillaceous sandstones, shales, and slates, overlying the compact limestones of the Trenton and Chazy beds, occupy an extended area in the northern part of New York State, adjoining the Canadian border, and then expand on both sides of the valley of the Hudson. Taking a south-western direction they are seen stretching through New Jersey, Pennsylvania, Maryland, and Virginia, in belts of varying width.

In Ohio there are 32 establishments in operation, producing about 600,000 bushels annually. These are situated as follows:—

Athens county	7
Guernsey county	2
Jefferson county	1
Columbian county	1
Meigs county	2
Morgan county	13
Muskingum county	6

In Illinois and Arkansas there are several other works carried on, but not to a large extent.

On the eastern shore of Lake Ontario they occupy an area of considerable extent, and taking a westward direction occur also on the north shore of Lake Michigan. In Ohio, in the district round Cincinnati, these beds are seen developed to a considerable extent, and also in a south-west direction through Kentucky and Tennessee. On the Mississippi River and in Wisconsin and Iowa, and in the south part of Illinois, different beds belonging to the lower group have been identified.

These different beds, constituting the Silurian system, are rich in mineral produce. Iron ores of a fossiliferous character, frequently mixed up with varying proportions of calcareous matter, are met with in the limestone deposits of the upper series.

Lead ores are found in both the upper and the lower. In New York State, the Ulster Lead Mine, situated in the Shawangunk mountain range is being successfully worked; and the important lead lodes at Galena occur in the limestone of the lower series.[*] This limestone, called by Professor J. Hall the Galena Limestone, may be traced through Wisconsin, Northern Illinois, Iowa, and part of Missouri. In the Trenton Limestone, in the northern part of New York State, lead ores have been found, but have not led to any profitable operations.

Copper ore has been found in the Shawangunk district, associated with the lead ores, and also in the lead district of the Upper Mississippi, particularly at Mineral Point, in Wisconsin.

Zinc (sulphuret) occurs in the State of New York, in the limestone in which the Ulster lead mines are situate.

Limestones are everywhere plentiful. The Niagara beds of the upper series furnish stones admirably adapted for building purposes, and which are in extensive demand in all the districts to which they can be conveyed; while the Trenton, Birdseye, and Chazy limestones of the lower series, from their compactness and fineness of grain, readily take a face which fits them for decorative architecture and even for internal ornamentation.

Some of the sandstones furnish excellent building materials. From the Potsdam beds, in the State of New York, large blocks are obtained which are very durable and easily worked: while the Medina and Clinton sandstones of the upper series, being of a more fissile character, furnish flagging stones in great abundance.

Mill-stones have long been manufactured from the compact conglomerate of the Shawangunk grit; and grinding-stones have been obtained from the Hudson River group, and also from the Lake Huron district; the latter are of a very superior quality.

The Onondaga beds of the upper series in the State of New York furnish salt in considerable quantities. The district round Syracuse is the principal seat of industry. These brine-springs have long been the source of considerable trade. In 1797, the year of the first leases of the salt lots, the gross quantity of salt made amounted to 25,474 bushels; in 1853 it was returned at 5,404,524[†] bushels. The brine-springs occur in the drift, which appears to act as a receiving bed for the percolation from the superior beds of the group which rise to a considerable altitude above the level of this valley on the south. In only a few cases have the borings gone done as low as the subjacent rocks.

Metamorphic.—These rocks are very largely developed in the New England States, producing very marked physical characters in the districts over which they are spread. The well-known and picturesque mountain ranges, the Green Mountains of Vermont, and the White Mountains of New Hampshire, belong to this formation. In Connecticut, to the east of the Connecticut River valley, and in the State of New York, they are extensively seen. From the southern limit of New York State they enter New Jersey, forming a continuous range of elevated land to the Delaware, and from the Delaware, ranging through the

[*] See page 50.

[†]

At Syracuse	1,294,909
Salina	2,734,200
Liverpool	803,535
Geddes	571,880
Total produce inspected	5,404,524

south-east part of Pennsylvania, they stretch through Maryland, Virginia, the Carolinas, and finally arrive at their southern termination in Alabama. This range of high lands stretches for several hundred miles north and south through the States, and is known as the "Blue Mountains," at some points arriving at a considerable elevation, at others the natural scenery is very beautiful, especially at those spots where the Hudson, the Delaware, and the Lehigh rivers have forced their way through the mountain barriers and thence found a road to the Atlantic Ocean. It is to these rocks that geologists assign the important auriferous belt identified in Virginia, North and South Carolina, and Georgia.

This metal naturally constitutes the first of the economic productions of the formation, as it is found to a greater or lesser extent throughout its entire ranges, from the southern banks of the St. Lawrence in Lower Canada, where it is being worked for in the Chaudière Valley, to Georgia, and is either obtained directly from the rocks themselves or from the debris or drift derived from their disintegration. In the north and east gold has been found, both in the rock and in the drift, but not to an extent to render the working of it a profitable operation; in the southern part of the range it is now being worked very successfully in several localities.

Iron ores form a very important feature in the economic produce of these beds. These are found either as magnetic oxide or mixed in varying proportions with the anhydrous peroxide, and occurring throughout the entire range of the formation, in many places in deposits of enormous extent. In New York State, in the Lake Champlain and Adirondac districts where they are very largely developed, they are mined upon a considerable scale. In New Jersey, Pennsylvania, and Maryland, they assume a high industrial value, and constitute an important element in the successful results of their iron industry. In Missouri they are seen under peculiar conditions, rising above the surface level to considerable elevations, and forming the two remarkable mineral deposits known as the "Iron Mountain" and the "Pilot Knob." In Wisconsin, Arkansas, and Texas, they are also known to exist.

Valuable beds of chrome-iron ore, associated with the rocks of this series, are met with in various localities from the northern limits of its range to as far south as Virginia. These are worked economically both in Pennsylvania and in Maryland; in the latter State the operations are upon a large scale and are of considerable importance.

Copper ores are met with in Connecticut at Bristol, and at other localities in that State, where they are worked upon a limited scale. They occur abundantly in the auriferous regions of Virginia and the Carolinas, and in the same formation in Maryland.

Lead ores have been found in several places in the upper beds of the group, but not at present in quantities sufficient to support any mining operations. In the gneiss of the lower group they occur to a considerable extent in Montgomery and Chester counties in Pennsylvania, at Rossie in Northern New York, and are gradually forming the basis of an important mineral industry. These also have been identified in several other districts along the range of these beds.

Zinc ores are found, associated with the lead ores, in various localities. Sometimes they are met with by themselves or accompanied by small proportions of lead ore. The important veins of the red oxide and "franklinite" occur in the metamorphic limestone of the mountain range in the State of New Jersey. This has already assumed the position of a highly important and interesting mineral industry.*

Native silver has been found in irregular deposits in the Ulster district of New York, and in Davidson county, and other localities in North Carolina.

Phosphate of lime is worked economically in the States of New York and New Jersey. It occurs in considerable quantities and in regular crystals. On the north side of Lake Champlain it is found mixed up in a paste-like manner with the magnetic iron ore. The extent and accessibility of this deposit render it susceptible of being worked in a remunerative manner; the mixed mass is pulverized and the iron ore separated by a magnetic screen.

Plumbago, of a moderate quality, is found and economically worked at several points in the same district of Northern New York.

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* See page 53.

Mica is found occurring in large masses in rocks of this age, but having rather of an igneous character. This is quarried upon an extensive scale at Grafton and Ackworth in New Hampshire, its produce being worked up and distributed all over the States, and even finding its way to foreign markets.

The well-known Quincy granite is obtained from a syenitic rock, quarried near Boston in Massachusetts. Building-stones of excellent quality and others suitable for paving and flagging purposes are met with throughout the group. In the New England States, Massachusetts, and Connecticut especially, they form important features of their mineral produce. In the Salem district (Massachusetts), and other localities, a syenite bed of a quartzose character furnishes mill-stones which have a good reputation, and are used to a considerable extent.

Grindstones, for fine pusposes, and whetstones are obtained from the different talcose and mica slate beds of this formation.

The slate-producing beds of Vermont, New York, New Jersey, and Pennsylvania, though doubtless purely sedimentary in their origin, have yet undergone sufficient metamorphic action to induce the American geologists to assign to them a position in this series.

Marbles resulting from metamorphic action upon the limestones of the lower Silurian group are obtained from several localities in the New England States, and also in Pennsylvania. They are not generally of fine quality, and are chiefly used for building and other external ornamental purposes.

Igneous.—The principal features of these rocks partake of a trappean or basaltic character. Accompanying the new red sandstone of the Connecticut River valley, they form prominent objects in the surface occupation of the country. Along the south bank of the Hudson, at the Palisades, and in several other places in the New York State, they are readily recognised, and may be traced occurring in irregular patches, and stretching southward through Pennsylvania, Maryland, Virginia, and North Carolina, everywhere accompanying the sandstone rocks of the Triassic series. In the Lake Superior district these rocks are very largely developed. At Keeweenaw Point they are very marked in their characteristics, and have been traced thence widening out into a broad belt west and southwest, and conforming generally with the lake shores. South-west again they are met with running along the banks of the Upper Mississippi, as far up as above the Falls of St. Anthony in Minnesota.

This series includes amongst its economic produce that remarkable deposit of native copper which has so often been the subject of scientific notice. The metallic copper is found in laminæ of varying thickness in the rocks on the south shore of Lake Superior, in the Keeweenaw district, where mining operations are carried on to a considerable extent.* In the porphyritic trap rocks yellow copper ore has been found, but has not been productively worked.

Associated with the metallic copper, silver has been found, sometimes in the copper or attached to the exterior of the mass, and at others in small distinct nodules or irregular masses. Lumps, or nuggets of larger size, have been met with in the debris of the rocks, accompanied by lumps of metallic copper.

Building-stones are obtained from the series in several places. In New York State they are quarried upon a considerable scale.

The great range of elevated rocks, chiefly of the metamorphic age, which, commencing at the north-eastern limits of the States, extends southward in an uninterrupted line down to Alabama, forms the principal depository of the mineral wealth of the country.

In the upper part of New York State, on the southern shores of Lake Superior, and in the Southern and Western States, Texas, Missouri, Arkansas, and Illinois, other distinct metalliferous districts exist; but it is believed that, beyond the limits of these well-defined ranges, no regular mineral deposits of any importance occur. The enormous development of the coal formation secures everywhere an illimitable supply of that all-important material. Distributed throughout the strata of the coal series, and equally along the range of the metamorphic rocks, are found beds of iron ore, some of them of enormous extent, and many of them extremely rich in quality.

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* See page 52.

Thus in these formations, the carboniferous and the metamorphic, are stored away the two great sources of a country's wealth—coals and iron—the backbones of its industry and the basis of its commercial prosperity. Happily, these, as well as the produce of the other mineral districts, are now within the range of transport communication with the great centres of consumption; ready markets absorb even their largest supplies; the various obstacles attendant upon the establishment of new industries have been gradually overcome, and the only element now wanting for their full and successful development—is time.

CLASS I.

MINERALS.—MINING—METALLURGY, &c.*

In the classification of the different substances to be exhibited, those having reference to minerals, mining and metallurgical operations, &c., were allotted to Class I. These comprise, however, a portion of raw materials which offer but little inducements to their possessors to send them for exhibition; they are not likely objects to attract the attention of the general visitor, and cannot, save in rare instances, by their display be productive of any benefit to their exhibitors. The Directors, therefore, in order to secure a proper representation of the mineral resources of their vast country, secured the services of Professor Benjamin Silliman, to whose charge they confided the collection of the requisite specimens and the general arrangements of the class. A certain sum of money was devoted to this object, and a separate room was assigned for their reception. This was not finished until several weeks after the opening of the Exhibition, indeed it was not until the early part of October that its contents were ready for inspection. In going through the collection I had the advantage of being accompanied by Professor Benjamin Silliman and his assistant, Mr. G. Brush, who gave me every information in their possession, and also by Professor James Hall, of Albany, whose acquaintance with the geology of the metalliferous districts was of great advantage to me. The class was, perhaps, one of the most complete in the building. The collection, though rich in mineral specimens, was, however, deficient in examples of their application, the metallurgical processes being confined to a few samples of pig-iron, &c.

The mode of arrangement, too, was somewhat peculiar, the several specimens being classified according to the particular State which produced them, without that regard to their mineralogical and geological relations, which, without detracting from the interest, would have added much to the instruction afforded by such a large and important collection.

This arrangement was, I believe, under the circumstances, unadvoidable; and had each State separately shewn the extent of its mineral resources, it would probably have given, better than by any other means, an idea of the great mineral wealth of the country. The contributions from the different States of the Union were, however, very unequal, and many highly important districts were entirely unrepresented. In the following remarks on the most important of the specimens, &c., exhibited, I have thought it best to adopt the same mode of arrangement, and to give them under the heads of their respective producing States.

Commencing with the *New England States;*

New Hampshire contributed specimens of tin ores, containing arsenic, from Jackson's mine; a small bar of tin, obtained from the ore, was also exhibited; the arsenic not obtained. These ores are met with only to a small extent, and, at present, have no economic importance.

Molybdenite, found in Westmoreland county, associated in the vein with phosphate of lime. A portion contains yellow oxide of molybdena already formed (very rare). Used as a source for obtaining molybdic acid.

Samples of blende and galena, from the Eaton mines, vein of moderately rich ore; at present worked by a company for the lead only.

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* The Jury awards in reference to the substances exhibited in this Class will be found in Mr. Dilke's Report, pages 12 and 13.

Specimens of magnetite, associated with epidote and hornblende, from Franconia, where it is worked on a limited scale.

Very fine specimens of yellow copper with tremolite, from Warren county, not worked.

Mica in large blocks as occurring in the vein-stone. This is now assuming a very important character at Grafton and at Ackworth, where the operations are carried out on a considerable scale. The mica is split up and sold in sheets of various sizes, suitable for the purposes to which it is applied. These are chiefly for the fire-fronts of stoves, lanterns, &c. Originally the locality where it exists was kept secret, the production was limited, and the selling price much higher than it is now. Beryls of large size and in great abundance exist throughout the rock. Can any use be devised for them? Some fine specimens were exhibited.

Fine specimens of quartz, beautifully clear, but with a brownish tint, and containing acicular crystals of titanium in large quantities.

Large block of plumbago, rather coarse in quality.

Vermont.—From this State were exhibited samples of bog manganese from Norwich county, worked upon a small scale for the oxide of manganese.

Large blocks of white statuary marble, quarried at Fairhaven, Rutland county, grain very fine and colour good, quite equal to the best Italian. Its value appears, however, to be somewhat questionable, as exposure to the weather had a sensible effect on the edges.

Specimens of lignite, or brown coal, found in Brandon county, containing fossil fruits, &c., in good preservation. This is used largely as fuel by the Brandon Iron Company, who exhibited a series illustrative of their manufactures, consisting of ores, fuel, slags, pig and wrought metals, paints, fire-clay, bricks, &c.

Statuary marbles, both white and coloured, from Plymouth, Brandon county; qualities moderate.

Large slabs of steatite, now being used extensively for hearths, ovens, and other work which is likely to be exposed to high temperatures.

Roofing-slates were exhibited from Rutland, Pulteney, and Castleton, of middling quality.

Massachusetts.—From Massachusetts the minerals exhibited were confined to some specimens of spodumene in very fine crystals, associated with phosphate of manganese [alluaudite], found near Norwich, and to some samples of lead-ore, which are worked on a small scale at Southampton, Hampshire county.

Rhode Island.—From this small State the substances exhibited consisted of specimens of coal, accompanied by fossil plants of the coal formation, worked at Valley Falls by the Blackstone Coal Mining Company.

A large block of magnetic iron ore in porphyry rock, found dispersed over the island in various places, in decomposed drift, sometimes *in situ.* The occurrence both of this ore and of the coal is too irregular to admit of their being worked economically upon any large scale.

Connecticut.—This State contributed largely to the Class, having sent a good series of Salisbury iron products, exhibiting ores, charcoal, fluxes, slags, pig and wrought metal, and various manufactured articles. These were contributed by the Cornwall Iron Company, by W. Sage of Lakeville, and Richardson and Co., of Salisbury.

A specimen of the ore from Munro Lanes Mine was exhibted, containing bismuth, tungsten, yellow oxide of tungsten (the only locality known I believe), galena, containing 3 per cent. of silver and magnetic pyrites in the same vein. In the immediate proximity veins of fluor-spar are met with, containing topazes of considerable size.

Samples of the produce of the Bristol copper mines, consisting of copper pyrites, glance, blue or variegated copper, and yellow copper, samples of the dressed ores, &c. This is a very old mine, and has been worked for many years past.

Argentiferous galena from Middletown, very rich in silver, and containing blende and copper pyrites in small quantities: samples of the dressed ore were exhibited. I could not learn whether any desilverizing process was carried on by the company working the mine.

Samples of the produce of the Chatham Cobalt Company, including mispickel, cobalt bloom, smaltine, and dressed smalt ores for market. The works have been quite recently commenced; the supplies, hitherto, having been obtained from the Western States, Missouri and Arkansas.

Some very fine crystals of sulphate of baryta with the vein rock were exhibited from Cheshire.

Specimens of the potash feldspar from Greenwich were exhibited. This is used very extensively in the State for pottery purposes.

A slab of serpentine from Milford of a green colour, and containing striæ of carbonate of lime. This is being worked now for ornamental purposes; the white streaks, however, deteriorate its value, as they appear to be affected by the action of the atmosphere.

New York..—The mineral produce of this State was very well represented From St. Lawrence county several substances of great interest were exhibited. The Great Northern Lead Mines sent a good series of lead ore, with specimens of fine crystals, dressed ores, residue, &c. Some very fine curious samples of galena were sent from Rossie, and also specimens of calcite, or double refracting spar, which is extensively used for optical purposes. Some fine large crystals of phosphate of lime were exhibited from different places in the country; and some curious samples of galena in calcareous spar intersecting strata of gneiss and containing from 8 to 10 per cent. of ore, with specimens of the reduced metal, were exhibited by the St. Lawrence Mining Company.

From Orange County some magnificent specimens of hornblende and of scapolite were sent. Also samples of magnetic iron ores of very fine quality, yielding from 55 to 60 per cent. of metal. These are smelted at Greenwood and Hudson River furnaces.

Some fine specimens of crystallized feldspar, associated with zircon, were exhibited. [No locality given.]

Samples from the Sterling Mine at Antwerp, Jefferson county, were exhibited, consisting of red hæmatite, containing oligist or specular ore; also sulphate of nickel (millerite) and hydrosilicate of iron (chalcadite).

Samples of the phosphate of lime, worked extensively for manuring purposes at Crown Point, in Essex county, were exhibited. These were stated to contain 80 per cent. of the phosphate.

Samples of the magnetic iron ore, mixed with phosphate of lime in syenitic and gneissoid rocks, used at the Crown Point furnace, were exhibited.

Specimens were also exhibited of the graphite obtained from the same locality. This is very abundant there, but of a coarse quality.

Some very fine specimens of crystallised sulphate of lime were sent from Lockport; some containing "celestine," and others crystals of sulphur. Samples of a gypseous rock were exhibited from Cayuga, containing sulphur interspersed throughout the mass. Both districts furnish large supplies for agricultural uses.

Samples of the mining produce of the Ulster Mining Company were exhibited, consisting of a large block of galena, and several other specimens of lead ore, and fine specimens of crystals of yellow copper. These mines are situate in Ulster county, and are now being worked upon a considerable scale.

An iron series from the furnaces at North-East was exhibited, showing the hæmatite ores, fuel, slags, &c., and metal both cast and wrought.

A large mass of the iron-ore bed running along the north shore of Lake Champlain was sent from Port Henry, at which place it is obtained. This is a remarkable ore, being the magnetic oxide with small crystals of phosphate of lime interspersed throughout the mass. Notwithstanding this, the ore is made available for furnace purposes, by passing it, after being crushed, through a magnetic sieve, which retains the iron oxide, and allows the foreign substances to run through. The phosphate of lime obtained is of sufficient value to pay the cost of the operation.

Some fine specimens of marbles from Lake Champlain were exhibited. They were obtained from the Chazy limestone beds, and were richly marked with fossil shells, chiefly crinoideæ, coloured more or less by metallic salts, and were sufficiently compact to take and retain a finely polished face.

These marbles are used extensively for ornamental purposes in New York.

New Jersey.—This State contributed as its mineral representatives, a good series of the produce of the New Jersey Zinc Company's ores, showing the ores in their various stages of preparation, and the oxide of zinc, paints, &c., made from them. This interesting and important industry is more fully described at page 53.

A fine series was also exhibited by the Trenton Iron Company, consisting of samples of the magnetic oxide ore, from their mine at Andover in Sussex county, and of the various manufactures from their furnaces at Easton, and from their rolling mills at Trenton.

Specimens of serpentine were exhibited, some containing "hydro-magnesite," both fibrous and lamellar, and others containing "arragonite." These are used economically to some extent in the fabrication of paints, the soluble silica being used as the basis of the pigments of the Serpentine Paint Company at Springfield, Massachusetts.

Blocks of very rich magnetic oxide iron ore, from the Tebo mine, Rockaway, were exhibited.

Pennsylvania.—The mineral resources of this important State were well illustrated by the fine and large collection of specimens which were displayed in this class. Foremost amongst these was a magnificent collection of lead ores, chiefly from the Wheatley Mine, near Phœnixville, which were contributed by Mr. C. M. Wheatley. These comprised specimens rarely met with of the chromate, molybdate, chromo-molybdate, phosphate, arsenio-phosphate, sulphate and carbonate of lead in splendid crystals, with samples of the galena and dressed ore. This mine is one of considerable interest, as it is probably the only one where systematic mining operations on any scale are carried out. Some details of the mining operations will be found at page 48.

Some fine specimens of corundum were exhibited from Chester county. This has at times been shipped in some quantity to England, where it was a few years back sold under the name of "Diamond dust," and used, when applied on leather, as a sharpener for razors.

Specimens of chrome iron ore were sent from Lancaster county, where the ore was formerly mined to a considerable extent in two different localities, neither of which is now worked.

Samples of lead and copper ores were exhibited from Gillysburg in the same county.

Some very beautiful specimens of lead ores, the produce of Warwick mine in Berkshire county, were exhibited, consisting of the silicates, carbonate and sulphate of lead in fine crystals.

From Charles county, some unique specimens of rutile were sent in fine bold crystals, geniculated, found in decomposed quartz in a talcose rock, and close to the surface.

A collection of whetstones from Potter county was exhibited. In some the stone was more compact and the grain finer than in others, apparently obtained from formations below the coal measures.

A very large and comprehensive series of the products of the Pennsylvania mines and furnaces, collected for the Association by Dr. C. M. Wetherill of Philadelphia, was exhibited in the section allotted to this State. These were all of great interest, as exhibiting the rich quality of the ores, hæmatite and magnetic oxide, so abundantly distributed throughout the country. Fine specimens were noticed of octahedral magnetic oxide; of the magnetic oxide, associated with zircon and allanite; and of the pipe hæmatite ore, micaceous ores, &c. Upwards of fifty different furnaces were represented in this collection, all working either with charcoal or anthracite coal. Amongst the latter were the extensive works of the Lehigh Crane Iron Company, at Catasauqua; of the Allentown furnaces, of the Glendon furnaces, and of the furnaces of the Trenton Iron Company at Easton. These are all large concerns, and are constructed upon a scale and a system quite equal to the best in this country.*

During my tour through the iron-making districts in Pennsylvania, I had an opportunity of visiting each of these works.

Samples of coals from all the most important seams in the three great anthracite basins—the Schuylkill, the Shamokin, and the Wyoming—were exhibited in this collection. In many instances these were accompanied by the iron products of the furnaces erected in their respective districts.

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* See page 36.

Besides these, there were specimens of other minerals found associated with them, as copper ores from several different localities, feldspar from Chester county, sulphate of strontia and molybdenite from Reading, zinc and lead ores from Lancaster county.

Specimens of the slate, quarried at Peach Bottom in York county were exhibited as slabs, and also, dressed in different sizes, as roofing slates. The texture of the slate was compact and homogeneous throughout; the colour good, and of such a fissile character as to split up into very fine slates. These were the best slates I had an opportunity of seeing in the States. At present, the demand for roofing-slates is very limited, though increasing every year. They are quarried and worked on the banks of the Susquehanna, about ten miles above its mouth; on the Lehigh and the Delaware rivers, where they intersect the range of the Blue Mountains, and also in the same mountain range in the State of Vermont. Those in the Lehigh and the Delaware water-gap I had an opportunity of visiting, and at the latter obtained the following particulars of the industry:—The quarry, which was being worked at an elevation of about 100 feet up the side of the mountain, was opened about fifteen years since, but the operations had never been on so extended a scale as at the present time. Slabs and slates of various sizes were made to order; of the latter, the following sizes were those usually supplied:—

14 × 12	at 65	dollars per 1,000.	16 × 10	at 27	dollars per 1000.
12 × 24	at 55	„	16 × 9	at 25	„
13 × 22	at 55	„	16 × 8	at 20	„
11 × 22	at 47	„	14 × 9	at 20	„
12 × 20	at 45	„	14 × 8	at 17½	„
10 × 20	at 39	„	14 × 7	at 15	„
18 × 11	at 39	„	12 × 8	at 13½	„
18 × 10	at 31½	„	6 × 12	at 10	„
18 × 9	at 27	„	6 × 9	at 9	„

These were the ordinary sizes and prices; for large quantities, special contracts were usually made. Contracts were also undertaken to supply the slates for roofing at per foot superficial; in this case the rate was at 6 cents per square foot without labour, or $4 75 cents per square of 100 feet, labour included. Want of means of transportation of their goods has been hitherto one of the great obstacles to the successful operations of the slate quarries on these rivers; the only period when they could get their goods to the market being during the winter and spring freshets. During the current year, however, a railway running through the water-gap will be ready for traffic, which will at all times furnish a ready mode of transit to Philadelphia, and thence to all the other Atlantic markets.

The workmen at the slate quarries I found to be nearly all Welchmen.

Delaware.—The only mineral produce of the State of Delaware was represented by samples of the feldspar found in Newcastle county, of which large quantities are consumed for pottery purposes.

Maryland.—The contributions from this State gave good evidence of the extent and importance of her mineral wealth. A well-arranged series of the products of the Mount Savage Iron Company was exhibited, consisting of the ores, chiefly clay carbonates and hæmatites, the fuel, semi-bituminous coal from the Cumberland basin, the slags, cinder pig-metal, and wrought iron, &c.; samples also of the fire-clays, bricks, and coke, were also shown.

The Patapsco Copper Company exhibited specimens of their copper, cobalt, and nickel ores; the copper ores were the sulphuret, carbonate, and fine specimens of malachite. Of cobalt there were fine specimens of the hydrous carbonate. A large mass of ore was sent by this Company, chiefly sulphuret of copper, with carbonate and silicates in small proportions.

Some good samples of the common yellow and variegated copper ores were sent from the Mineral Hill Mines in Carrol county.

The Baltimore Copper Company exhibited a good series, consisting of ores, native and foreign, slags, &c., and the metal in its various processes of preparation.

The Carrol and Potomac Mining Company sent specimens of their copper ores, both yellow and variegated sulphurets.

The chrome iron ores from Anne Arundel county were represented by specimens of the produce of Wood's Pits. The ore was free from impurities, and contained both green and violet rhodochrome.

The Springfield mines, in Carrol county, the old Liberty mines, and the Dollyhide copper mines, all in Frederick county, sent samples of their ores.

Samples of the iron ores, &c., used at the Ashland furnaces, Baltimore county, were sent. The series contained the ores, chiefly from Mount Airey and Mineral Hill, fuel, slags, and manufactured produce.

A smaller series was contributed from the Oregon furnaces, Baltimore county: these consisted chiefly of the ores (hæmatite), and limestones.

A large block of semi-bituminous coal was exhibited in the yard from the Parker vein, George's Creek, in Alleghany county.

Virginia.—The collection furnished by this State contained many interesting and important specimens, including some rich specimens of gold in quartz and gneiss associated with iron pyrites and calcite, which were sent from Garnetts, Buckingham county. This is the seat of a considerable mining operation, and is reported to be very remunerative to the adventurers.

Other specimens of native gold were exhibited from Moss mine, in Goochland county, and from Munro mine, in Stafford county, where it is found disseminated through quartz and associated with tetradymite.

From Fanquier county samples of a massive vein of sulphate of baryta were sent; and specimens of the same mineral were exhibited from Eldridge's mine, in Buckingham county, of a remarkable character, and in large and fine crystals, showing the progress of crystalline action under disturbing conditions.

Copper ores were exhibited from the Friesland mine, Manasses Gap, and from Blue Rider, in Orange county. The former consisted of red oxide and of native copper; the latter contained samples of native copper, of the red oxide, blue carbonate, and epidote.

A very large specimen of Dog's-tooth spar (calcite) from Weyer's Cave, in Augusta county, was exhibited, where it is obtainable in large quantities.

Some fine specimens of rutile (oxide of titanium) in quartz, were exhibited from Lynchburg, in Campbell county.

Samples of the cannel coal, worked both on the Big Coal River and the Little Coal River, in Kanawha county, and on Coal River, in Boon county, were exhibited. There are several veins of this coal, occupying considerable areas in Western Virginia, and cropping out on the banks of the rivers tributary to and running into the Ohio. They are generally of very good quality, and are much sought after for gas purposes, and also for steam-boat use. Difficulties have hitherto existed in the way of transportation to the various markets, but several of the rivers have had their navigation improved, and the intersection of the country by railroads has already removed most of the obstacles, and a large trade must rapidly spring up.

North Carolina.—The auriferous beds in this State furnished the principal specimens of her mineral treasures. The produce of the auriferous chain running from north-east to south-west, through North and South Carolina, was well represented.

From Capp's mine, in Mecklenburg county, were sent specimens of auriferous pyrites found in compact quartz and in talcose slate. From Cabarus county, specimens of gold occurring in quartz and in decomposing feldspathic rock were exhibited, with a portion of the amalgam, and of the pure gold. From Rutherford county, samples of gold in quartz; from Carson county, gold in quartz also; and from Montgomery county, specimens of auriferous pyrites in talcose slate vein, were exhibited, as also specimens of auriferous pyrites occurring in the same veins in Rowan county, at the Gold Hill mines, which latter are being worked, it is said, very profitably.

Specimens of silver lead were exhibited from Washington mine, in Davidson county. This was a very fine collection, containing beautiful specimens of sulphuret, phosphate, carbonate, and sulphate, with native silver in large proportions. Samples of the silver and the lead were shown, for both of which the mine is in successful operation.

The ores of the North Carolina Copper Company were exhibited. These chiefly were the produce of Guildford county, where they are worked to some extent. The samples of yellow copper were accompanied by samples of the veinstone.

Some large slabs of the flexible sandstone, found near Elkville, were exhibited, as also some curious specimens of pseudo-morphous quartz from Rutherford county. Some of the samples contained water in the cavities occurring in the mass.

From Lincoln county specimens of amethystine, of fine colour, and in large and perfect crystals, were exhibited; and from Gaston county specimens of the lazulite, which occurs there in large quantities, were shown.

South Carolina.—This State contributed a large collection of rich specimens of the gold obtained from the Dorn mines, in Edgefield district. The gold is formed in a decomposed quartz vein, in a slate formation, and is worked upon a considerable scale, and with very profitable returns.

Samples of the black oxide of manganese from the same district were exhibited.

Alabama.—From this State but few specimens of minerals were sent. Iron ores were sent from Talladega county and from Shelby county. These were chiefly hæmatites, some of them fossiliferous, from the carboniferous series.

Samples of marbles, both plain and coloured, from Banton county, were exhibited.

Some small blocks of bituminous coals, from St. Clair county, were also sent.

Tennessee.—The mineral resources of this State were but very inadequately represented.

Some remarkable specimens of copper ores were sent from the Hiwassee mines, in Polk county. These exhibited a curious process of decomposition they have undergone in the vein. In the upper part peroxide of iron existed, immediately below which was a stratum of sulphate of copper,—the whole being underlaid by a thick vein of the ordinary yellow sulphuret. These mines are worked successfully for copper.

Arkansas.—The collection contributed by this State consisted only of some fine specimens of brookite (ox. titanium), in fine crystals, found near Magnet Cove, in Hotsprings county, where it exists in great abundance.

Some splendid crystals of quartz, and specimens of "elaeolite" (a feldspar), a mineral containing 22 per cent. of alkali (6 of potassa and 16 of soda), easily decomposable by acids, were exhibited as the produce of this State.

Missouri.—The more important mineral productions of this State were very fairly represented in Class I. They included a very good collection of the ores and products of the Marameng Iron Works, which were contributed by the St. Louis and Birmingham Iron Company, comprising samples of ores, fuel, clays, limestone, slags, and pig and wrought metal, &c.

The Madison Iron Company exhibited a series of their ores and furnace products; they also sent a large block of the ore from "Pilot Knob," a well-known and remarkable deposit about 500 feet high, and having a base nearly half a mile in diameter. A large block, of similar dimensions, was exhibited of the ore obtained from the "Iron Mountain," another remarkable deposit in this State. The ore of the Pilot Knob was the peroxide and magnetic oxide, combined, apparently, with argillaceous matter, giving it a slaty fracture and character; that of the Iron Mountain is a hæmatite, containing silica. The Merrimac Iron Company sent a series of ores from Crawford county, and also samples of their furnace products. These were specular iron ores.

Copper ores, carbonates, and pyrites, were sent from some old copper mines, not now worked, in Shannon county. Samples of them, dressed, ready for market, were also shown.

From Mine la Motte samples of lead ores, and of copper, cobalt, and nickel ores, were sent. The lead ore was the ordinary sulphuret. The copper, cobalt, and nickel ores were moderately rich. They were submitted to a partial process, and worked up into a mass as a subsulphuret of the three bases, and then sent to market (mostly to Philadelphia) to be separated.

Specimens of lead ore from Franklin county, and also from St. Francis county, were exhibited. These contained some fine crystals of sulphate and of carbonate of lead, combined with galena.

From Washington county some good samples of galena were sent.

Specimens of the grey limestone from St. Louis county were exhibited. These were compact, and took a good polish; the colours were also good.

Cannel coal was exhibited from two localities—Côte sans Dessein, in Callaway county, and Arrow Rock, in Saline county. Of that from the latter a large block was shown in the yard, and appeared of very good quality.

Utah.—A solitary sample of rock-salt represented the mineral produce of this distant territory.

Wisconsin.—This new State substantiated its claim to a place in Class I by two contributions of its mineral produce.—These comprised some lead ores of very good quality, but with no locality attached to them, and a mass of metallic copper of large size, found near Millwaukie in the drift, fully 250 miles *south* from the nearest known deposit of metallic copper.

Illinois.—Specimens of the fluor-spar, which exists in this State in great abundance, were exhibited, as were also some fine specimens of quartz, containing rutile.

Michigan.—From this State, which includes the mineral districts of Lake Superior, some very interesting specimens were sent. A large block of metallic native copper, weighing 6,300 lbs., was sent for exhibition by the State Agricultural Society. This had a thickness of 24 inches, and on its 4 sides showed the marks of the chisel which had separated it from the mass, of which a surface equal to 150 tons in weight had been exposed.

Specimens of native copper in quartz were also exhibited from the Derby mine, the Windsor mine, and the Warwick mine.

The iron ores from Jackson's Mountain, consisting of a slaty peroxide, and also of the magnetic oxide, and from the mines worked by the Sharon Iron Company at the same place, were exhibited. These were of rich quality and were accompanied by an illustrative series of furnace products.

A private collection, representing the rarer minerals found in the States, was exhibited in this department. In this were fine specimens of prehnite with copper interspersed through the mass,—analcine—calcite, good crystals—apophyllite—splendid crystals of native copper in calcite—stilbite—zeolites, &c.

A collection of agates of large sizes was exhibited. These are found in great quantities in the Lake Superior district. In the same district at Ance Bay, oil-stones are obtained. These have a good reputation and are supplied extensively to the different markets of the Union. The collection contained specimens, of various qualities, both fine and coarse grained.

Ohio.—From this State the minerals sent were unimportant, save as representatives of the enormous deposits of coal and iron which are known to exist in the State, and which must, ere long, tell their own tale in the industrial future of the Western States. The samples of coal were mostly accompanied by the iron ores which are found associated with them. These are the usual clay-carbonates of the coal measures, apparently rather lean in quality. The coals were both bituminous and cannel, and were sent from Venton, Perry, Jackson, and Hocking counties.

Kentucky.—This State only contributed samples of the Hawsville bituminous coal, which is worked to some extent for steamboat and household purposes,—and a fine specimen of gypsum from the celebrated Mammoth Cave.

California.—A large case was exhibited by Messrs. Adams, containing specimens of the gold found in upwards of 200 different localities in this State. These were all distinctly designated, and in some cases were accompanied by massive ingots and bars melted from them. Some fine large lumps of native cinnabar, the produce of California, were exhibited.

The foregoing comprise the principal objects exhibited as the produce of the United States. Besides these, there were, to a limited extent, specimens of the mineral produce of other countries.—New Brunswick and Nova Scotia sent samples of coals and gypsum.—From Cuba, copper ores were sent.—From Mexico and Chili, some beautiful specimens of silver ores.—England contributed a very meagre and unimportant collection.—France, a single cabinet, suitable rather for educational than industrial purposes.—Holland, Sweden and Turkey, a single article each.—Italy, samples of copper ore; and cinnabar from Tuscany; and the Zollverein some good samples of lithographic stones from Solenhofen, and some cabinet specimens of minerals. Some small private collections were exhibited which contained many very beautiful and interesting specimens both of American and foreign minerals. The collection of tourmalines, green and red, exhibited by Professor Shepherd of Newhaven, and in the selection sent by Professor Benjamin Silliman, from his private cabinet, the following specimens, both for their beauty and rarity, were well worthy of a special notice:—

Pickeringite.—A magnesian alum, from Iquiqua in Peru.

Fluor-spar.—Very highly modified crystals, from Northern New York.

Sulphate of Baryta.—Remarkable crystals from Cheshire, Connecticut.

Spinel.—Very large and perfect crystals [4 inches in diameter], from New York State.

Quartz.—A large crystal [8 inches in diameter], containing crystals of oxide of titanium.

Datholite.—A *hydrous* boro-silicate of lime,—very finely crystallized, from Connecticut.

Danburite.—An *anhydrous* boro-silicate of lime, from Danbury, Connecticut.

Phlogopite.—A magnesian mica, very fine crystal, 10 inches in diameter.

Spodumene.—Unique crystals—this mineral contains 5 per cent. of lithia.

Labradrite.—A large and beautiful slab, finely polished.

Euphylite.—A new American mica, recently discovered by Professor Silliman.

Clinochlore.—An American chlorite—it is bi-axial.

Tourmaline.—Red and green from Paris, Maine—obtained from the same locality as Professor Shepherd's.

Columbite.—Said to be the most perfect and beautiful crystal known—only one larger has hitherto been found.

Emerald Nickel.—A hydrous carbonate of nickel. This mineral was first described by Professor Silliman.

The collections sent by Messrs. Clay, and by Dr. Genth, of Philadelphia, and by Professor Spencer Baird of the Smithsonian Institute, Washington, afforded much gratification and information to those interested in the study of the rarer minerals.

Class I.—Coals.

The enormous development of the coal formation on the continent of North America has been the subject of great interest to all who have studied the political economy and industrial progress of that great country. Accustomed as we are gratefully to acknowledge the important bearing of our coal formation upon the commercial progress of our country and upon so many of our social enjoyments, we cannot but recognize in the bountiful and widely distributed deposits of the New World, the elements of a commercial future, whose prosperity shall be limited only by the measure of judgment and skill which are brought to bear upon it.

These coal deposits present features of great importance and interest to the geologist; their immense area, varying surface, &c., supplying a constant field for the researches of the man of science and for the development of those economic applications which have of late years given such value to the possession of mineral fuel. In the distribution of work by Her Majesty's Commissioners all geological portions were assigned to Sir C. Lyell, while the economic relations of Class I. were at the same time committed to my charge. I therefore have to refer to Sir C. Lyell's Report from time to time to fill up such blanks as the absence of accompanying geological notice may cause in my own. In regard to the great coal formation of the United States, but few even of the American general geologists have had better opportunities for observation than Sir C. Lyell.

In reference, however, to particular deposits, many important advantages have arisen from the special investigations undertaken either at the cost of the State or for private or scientific purposes. I hoped to have been able to have availed myself of the recent re-examination of the Great Eastern Coal Field of Pennsylvania, by Professor H. D. Rogers, which has been looked forward to for some time past with great interest, but which, from the annexed communication to me is not likely to be completed before the end of the present year.

> "I am sorry that I am not ready to comply with your request for the result of my observations on the coal-fields of Philadelphia. At the time of our conversation I confidently anticipated being able to complete my researches in the anthracite basins of Eastern Pennsylvania, and even to pass across the wide bituminous coal region of the western division of the State with sufficient deliberation to permit me to make those comparisons in detail which form one object of my memoir. But the topography of the Wyoming Basin, upon the minute mapping of which we were then just entering, proved to be far more intricate than I had anticipated, and demanded so large a share of my time as to cut me off for the season from even a visit to the Western Coal Field. I have found the geological structure, too, of the Wyoming Basin far more complex than I had supposed, though already somewhat familiar with it. This retardation of my visit has forced me, therefore, to postpone the completion of my comparative general sketch of the Pennsylvania and Ohio coal-field to a future season."

I regret the more not having the advantage its contents would have afforded me as they relate to those beds which at present supply the entire demand of the Atlantic States, and upon which, of course, the great commercial and manufacturing interests of the country are centred. The following rough sketch of the coal deposits of the United States will give some idea of their magnitude and importance. Their entire area is generally taken at from 140,000 to 160,000 square miles, which are occupied by, and constitute the, three great coal fields, known as:—1,—the Great Eastern or Alleghany 2,—the Great Western or Indiana and Illinois; and 3,—the Michigan.

No. 1. The Great Eastern or Alleghany Coal Field, which includes the anthracite basin of Eastern Pennsylvania and the bituminous beds of Western Pennsylvania and Ohio, occupies nearly one-half of the area, extending between 700 and 800 miles in length, and having a mean breadth of 85 miles, and ranging through the States of Alabama, Georgia, Tennessee, Virginia, Kentucky, Ohio, Maryland, and Pennsylvania, in about the following proportions:—

	Square miles.
Alabama	3,400
Georgia	150
Tenessee	4,300
Virginia	21,000
Kentucky	9,000
Ohio	11,900
Maryland	550
Pennsylvania	15,000
	65,300

No. 2. *The Great Western or Indiana and Illinois* Coal Field occupies a large portion of both those States and is seen also to some extent in Kentucky on the one side, and according to Dr. D. D. Owen's Report occupying an extensive area both in the States of Missouri and of Iowa on the south-west. The total area is differently given by different geologists—probably 50,000 square miles would not be too high an estimate for that portion which has been regularly surveyed, of which upwards of 30,000 to 35,000 occur in the State of Illinois; from 7,000 to 8,000 square miles in Indiana, and about 5,000 in Kentucky.

No. 3. The Michigan Coal Field has not been subjected to the same strict examinations as the others, and at present its limits are not so well defined. Its proximity to the great metalliferous region of Lake Superior, and its position between the two great lakes, Huron and Michigan, must, sooner or latter, attract public attention and obtain for it that careful investigation by which the establishment of a mineral industry must be materially influenced. Its area, according to the original surveys of Dr. Douglas Houghton, is about 11,000 square miles. This estimate, according to Taylor, is too high; he gives it at 5,000 square miles.

Notwithstanding the great area of the western coal-fields and the rapid growth of cities in their immediate proximity, constituting as it were great centres of consumption and seats of manufacturing industry, at present the only portions which can come within the limited range of my Report are the deposits on the east side of the Alleghanies. They are the only ones really of importance to this inquiry, as they furnish nearly the entire supply to the whole of the Atlantic States.

These comprise the three anthracite coal-fields of Eastern Pennsylvania, known as the—Southern or Schuylkill,—the Middle or Shamokin,—and the Northern or Wyoming,—and the Frostburg or Cumberland Coal Field (semi-bituminous), in the State of Maryland. Besides these beds a small outlying bed exists in Pennsylvania of semi-bituminous coals, known as the Broad Top, which, however, owing to its insulated position, being without any means of access, is only available for local purposes; and some deposits of considerable area in Virginia, whose importance is being daily recognised and whose produce is gradually finding its way into the markets. The demand at present, however, is confined chiefly to gas-making purposes.

Of the three anthracite beds of Pennsylvania, the Southern or Schuylkill is both by situation and magnitude the most important, and furnishes a large proportion of the entire supply. It presents great facilities of access, which have been made advantageous use of by two canal companies, the Lehigh and the Schuylkill, and by the Reading Railroad, which penetrate far into the interior and form the great outlets for its produce. Other railways are now in progress which will not only afford additional facilities of transfer to the Atlantic cities, but also open a communication to the lakes, and through them to the western markets.

The history of the coal industry of the United States belongs quite to the present generation; having had no existence anterior to 1820. In that year the Lehigh Coal and Navigation Company, (which was originally established so far back as 1793 under the title of the Lehigh Coal Mining Company, but which, from various causes had never got into effective working), sent the first fruits of its operations to Philadelphia in the shape of sundry craft loads of coal, amounting in the aggregate to 365 tons. This quantity, however, small as it was, completely stocked the market, and was with difficulty disposed of in the course of the year. The trade increased slowly but regularly, the Lehigh Company having the market to themselves until 1825, when the Schulykill Navigation Company, having completed their works, opened a direct communication between the centre of the coal field and the city of Philadelphia.

The Lehigh navigation commences at Mauch Chunck, at which place the coals are delivered by the different mining companies of that region; of these there are several whose produce finds its way to market through this channel. The Lehigh Company are the largest proprietors and furnish one-half of the whole supply. The last returns, 1852, give 1,114,231 tons as the gross amount sent to market by this coal region, of which—

	Tons.
The Company's mines furnished ..	510,406
The Beaver Meadow Mines	46,280
East Sugar Loaf	12,566
Spring Mountain	139,627
Colerain	37,848
Hazleton	130,628
Cranberry	48,920
Sugar Loaf	41,763
Buck Mountain	104,202
Wilkesbarre Coal Company	41,990
	1,114,231

The whole produce descends by the Lehigh Slack-water Navigation Canal down to Easton, where it joins the Delaware, a distance of above 50 miles, a portion of it finding a market in the districts on the line of the canal. Thence a small portion proceeds by the Morris Canal, through the State of New Jersey to Jersey city, but the great bulk is brought down the Pennsylvania State Canal to Bristol, and thence down the Delaware to Philadelphia, or through the Delaware and Raritan Canal to New Brunswick, and thence by the Raritan River to New York. The distribution of the produce of 1852, 1,114,231 tons, was as follows:—

	Tons.
Consumed on the line of the Lehigh Canal	151,654
Passed into the Morris Canal	180,189
Passed into the Delaware Division of the Pennsylvania State Canal	782,388
	1,114,231

The following statement of the quantity of coals sent to market from this region each year presents a very satisfactory appearance:—

	Tons.		Tons.
1820 ..	365	1837 ..	223,902
1821 ..	1,073	1838 ..	213,615
1822 ..	2,240	1839 ..	221,025
1823 ..	5,823	1840 ..	225,318
1824 ..	9,541	1841 ..	143,037
1825 ..	28,393	1842 ..	272,546
1826 ..	31,280	1843 ..	267,793
1827 ..	32,074	1844 ..	377,002
1828 ..	30,282	1845 ..	429,453
1829 ..	25,110	1846 ..	523,002
1830 ..	41,750	1847 ..	643,973
1831 ..	40,966	1848 ..	680,746
1832 ..	70,000	1849 ..	801,246
1833 ..	123,000	1850 ..	722,622
1834 ..	106,244	1851 ..	989,296
1835 ..	131,250	1852 ..	1,114,231
1836 ..	148,211		

The Schuylkill Navigation Company commenced operations in 1825, some five years after the Lehigh Coal Company had opened a communication between the north-east portion of the coal-field and the Atlantic markets. The canal runs direct from the mines in Schuylkill county directly down to the city of Philadelphia, a distance of upwards of 100 miles. Here a large portion finds its market; that intended for New York is taken round by the Delaware, the Schuylkill joining that river a little below the city, to Borden Town, thence by the Delaware and Raritan Canal to New Brunswick, and onward by the Raritan River to New York. Shipments are made to other seabord cities direct from the Delaware. There are several different mines worked by companies or private individuals, but all must come through the Schuylkill Navigation Company, and hence are dependent on it for their mode of transport. The following statement gives the amount of coal brought to market by this company's canal each year since they commenced operations:—

	Tons.		Tons.
1825	6,500	1839	442,608
1826	16,767	1840	452,291
1827	31,360	1841	584,692
1828	47,284	1842	491,602
1829	79,973	1843	447,058
1830	89,984	1844	398,887
1831	81,854	1845	263,587
1832	209,271	1846	3,440
1833	252,971	1847	222,693
1834	226,692	1848	436,602
1835	339,508	1849	489,208
1836	432,045	1850	288,030
1837	528,152	1851	579,156
1838	433,291	1852	

In 1841 the Reading Railroad commenced operations. This road takes a course nearly parallel with the canal, connecting Pottsville, in the heart of the coal district, with Philadelphia, a distance of 95 miles. The coal intended for consumption in Philadelphia is carried direct to the city; that for other markets, New York, Boston, &c., is carried by a branch rail to the company's wharf at Richmond, on the Delaware, a little above the city, whence it is shipped direct to its destined market, either by the Delaware and Raritan canal or by long sea. This railway, whose principal support is the coal traffic, has very important natural advantages, which have conduced much to the successful results attending its operations. On a heavy-carrying traffic, like that of coals, the hauling is all one way, and a great loss is, under ordinary circumstances, sustained by the trucks having to return, for the greater part, empty; and by the want of employment for the motive-power, which must necessarily be kept in action, and which constitutes a considerable item in the working expenses. Now the line of the Reading railroad has a descending gradient of about 6 feet in the mile throughout the whole of its course, thus a great portion of the actual transportation is effected by the mere force of natural gravity, the motive power required for the traction of empty trucks back again being found fully sufficient to bring the loaded trains down from the mines. In this respect it resembles several of our mineral lines in South Wales, though upon a much larger scale. The trade carried on by this railroad is very extensive, and shows a very considerable rate of increase annually, as is seen by the following statement of returns since its opening, in 1841:—

	Tons.		Tons.
1841	850	1847	1,360,681
1842	49,902	1848	1,216,233
1843	230,254	1849	1,115,918
1844	441,491	1850	1,423,977
1845	820,237	1851	1,605,084
1846	1,233,142	1852	

The Shamokin, or middle coal-field of Pennsylvania, at present contributes but little to the great markets of the country, merely furnishing a supply for the consumption of the districts immediately connected with the mines. Bounded by the valley of the Susquehanna on the south-west, and by the valley of the Lehigh on the north-east, and possessing beds of unusual richness and regularity, it offers great inducements for the investment of capital in the development of its produce, which has only been delayed by the deficiency of communication with the great consuming markets. This want will speedily be relieved by the railways now in progress, which will give it facilities of transportation fully equal to those of the Schuylkill or the Wyoming regions. The Philadelphia and Sunbury railroad, now nearly completed, runs from Sunbury, at the junction of the two branches of the Susquehanna, through the very heart of the coal region. This road is designed to form connections at its eastern and western termini with others, which will reach the most desirable markets of the country. From Sunbury, its starting point, two new and highly important railways diverge: the Great Sunbury and Erie Railroad, and the Baltimore and Susquehanna, thus opening up a direct communication with the Atlantic seaboard on the one side and the Great Western Lakes on the other. These two lines are in a state of active progress, and will no doubt be supported by a large mineral traffic, which will be derived principally from this coal-field.

Eastward from Sunbury, the Philadelphia and Sunbury Railroad takes its course through Shamokin and Mount Carmel to the Mine Hill Extension at Ashland, which road intersects the Reading Railroad about 4 miles south of Pottsville, forming thereby a direct line of communication between the lakes and Philadelphia. The Philadelphia and Sunbury railroad, from Sunbury to Ashland, between which two places it traverses continuous coal-beds of excellent quality, is about 30 miles in length. At Mount Carmel, 6 miles east of Ashland, where mining operations upon a considerable scale are in progress, a branch line of easy gradients, some 9 miles in length, is about to be constructed to intersect the Catawissa Railroad. This line, with its connection with the Lehigh and Easton Railroads, and the New Jersey Central Railways, will give the Shamokin, or Middle Anthracite Coal-fields, ready access to the New York markets, the entire distance between Mount Carmel and that city being, by this route, only 130 miles.

Thus, in a short period, it is probable that the produce of this middle coal region will find its way, either westward, through the Sunbury and Erie and the Baltimore and Susquehanna Railroads, or eastward, through the Philadelphia and Reading and the Mauch Chunk, Easton, and New Jersey central lines, to the principal markets of the country, and compete successfully for a full share of the rapidly-increasing demand.

The Northern or Wyoming coal-field, is the largest and most compact of the three divisions, forming an elongated basin; the western portion constitutes the beautiful valley of Wyoming, through which, for many miles, the Susquehanna takes its course, while the eastern portion forms what is known as the Lackawanna coal region. This latter, having direct communication with New York, furnishes at present the principal supply of mineral produce, the only natural outlet from the Wyoming district being the Susquehanna river, whose waters furnish the means of transportation to a limited tonnage of the produce of this as well as of the Shamokin basin. The most important working point in the Lackawanna region is Carbondale, situated at its north-east end. The mining operations there are carried on chiefly by two large companies, the Delaware and Hudson Canal Company and the Pennsylvania Coal Company, whose interests, I believe, may now be looked upon as being united under one general arrangement. The first communication with the coal-field was opened by the first-named company, a railway running from Carbondale to Honesdale, and thence by a canal following the course of the Wallkill river, and running down from Honesdale to Rondout, on the Hudson river, a distance of 110 miles.

Rondout is about 90 miles from New York, and less than that distance from Albany, Troy, and the Great Erie Canal, where good and constant markets are always found for the produce. In the Pittston districts large collieries are worked by the Pennsylvania Coal Company. The produce is conveyed by a railroad running from Pittston to Hawley, on the Delaware and Hudson Canal, about 44 miles distant from Pittston and 11 miles below Honesdale; thence the coal is carried by canal to Rondout, on the Hudson, and then distributed in the same markets as that from Carbondale. The minerals worked by private individuals all pass through the same channel. The Canal Company commenced operations in 1829. The following statement gives the amount sent to market each year since that date:—

	Tons.		Tons.
1829	7,000	1841	192,270
1830	43,000	1842	205,253
1831	54,000	1843	227,605
1832	84,600	1844	251,005
1833	111,777	1845	273,435
1834	43,700	1846	320,000
1885	90,000	1847	388,203
1836	103,861	1848	437,500
1837	115,387	1849	454,240
1838	78,207	1850	550,417
1839	122,300	1851	795,095
1840	148,470	1852	

The total produce for the past year (1853) of the Wyoming coal-field was estimated at 1,000,000 tons, of which about 500,000 pass along the canal to Rondout, on the Hudson; about 150,000 tons are sent from Scranton, *viâ* the

Lackawanna railway, to the interior of New York State and along the lake shores, and about 350,000 tons are sent down the Susquehanna. This portion I shall again have to allude to. The Lackawanna coal is in great and increasing demand for all the river steamboats. The lake-trade, too, is rapidly increasing. Indeed, a large increase in the produce of the Wyoming coal-field may be looked for on the completion of the line of railway through the Delaware Water Gap. This will certainly be finished by the summer of 1855; and as there will, in all probability, be two lines competing for the traffic, the facilities of transport thus afforded, and the proximity of the coal-field to New York, give it better prospects of success than that of either of the other anthracite regions.

In addition to the coal-traffic already enumerated, the Suquehanna, which runs through the centre of the Wyoming coal-field, and skirts the south-western extremities of the Shamokin and the Schuylkill fields, affords means of transportation for a considerable tonnage, the principal portion of which is mined at Wilkesbarre, in Wyoming valley, and, lower down, at Shamokin and Lykins valley. The produce is sent down the river, and finds a market in the interior towns of the State, where it is used for domestic purposes, or for furnace operations at Catawissa, Danville, and other places. A small portion finds a market in Baltimore. The aggregate amount produced from these sources is given as follows:—

	Tons.		Tons.
1839	11.930	1846	205,075
1840	15.505	1847	299,302
1841	21,463	1848	256.627
1842	57,346	1849	304.055
1843	68,000	1850	300,934
1844	127.993	1851	415,099
1845	188,401		

Thus it appears that fully four-fifths of all the coal produced from the three great anthracite regions of Pennsylvania, the greater part of which finds a market on the Atlantic seaboard, is centred at the head waters of three small streams—the Lehigh, the Schuylkill, and the Lackawanna,—and is more or less under the control of the four great companies;—the Reading Railway, and the Schuylkill Navigation Company, working the southern or Schuylkill region; the Lehigh Company, working the Lehigh region; and the Delaware and Hudson Canal Company, in combination with the Pennsylvania Coal Company, working the Lackawanna region. The first three companies are located at Philadelphia, the latter at New York. The Philadelphia companies furnish the entire supply to their own city first, and then forward the surplus to New York, Boston, and the other eastern markets, probably to the amount of three-fourths of the whole supply. The Delaware and Hudson companies confine their operations to the markets of New York and the Lake districts.

In order to arrive at a correct estimation of the development and actual state of the coal industry of the anthracite regions of Pennsylvania, the following summary of the produce of the several districts already enumerated is given; this shows the total amount of coal sent to market each year, from the beginning of the trade by the Lehigh Navigation in 1820, up to the close of 1851:—

		Tons.
Lehigh Navigation Company commenced operations	1820	365
” ” ”	1821	1,073
” ” ”	1822	2,240
” ” ”	1823	5,823
” ” ”	1824	9,541
The Schuylkill Navigation Company commenced operations	1825	34,893
” ” ”	1826	48,047
” ” ”	1827	63.434
” ” ”	1828	77,516
Delaware and Hudson Canal Company commenced operations	1829	112,083
” ” ”	1830	174,734
” ” ”	1831	176,820

		Tons.
Delaware & Hudson Canal Company	1832	363,871
" " "	1833	487,748
" " "	1834	376,636
" " "	1835	560,758
" " "	1836	684,117
" " "	1837	862,441
" " "	1838	725,697
" " "	1839	797,863
" " "	1840	841,584
Reading Railroad commenced operations	1841	942,312
" " "	1842	1,076,649
" " "	1843	1,240,710
" " "	1844	1,596.378
" " "	1845	1.975.113
" " "	1846	2,284,656
" " "	1847	2.914.852
" " "	1848	3,027,708
" " "	1849	3,164,667
" " "	1850	3,285,980
" " "	1851	4,383,730

This aggregate statement presents a very satisfactory appearance as during the last ten years from 1841, the first year in which all the large companies were in active operation, to 1851, a regular and largely increased production is shown. In the five years from 1841 to 1846, the annual production increased from 942,312 tons, to 2,284,656, or at the rate of 142 per cent. During the succeeding five years, from 1846 to 1851, it increased from 2,284,656 tons to 4,383,730 tons per annum, or at the rate of 92 per cent. The average of the two periods would give an increase equal to 117 per cent. every five years.

This large annual increase in the demand for coal seems hardly to have been expected, or, at all events, provided for, by either of the large carrying companies mentioned, as they have already arrived at their maximum capacities, and either they must increase their carrying resources, or other channels must be opened by which the surplus can be conveyed to market. The Lehigh canal, as I have before stated, runs from Mauch Chunk down to Easton, at the junction of the Lehigh river with the Delaware. Here it meets the two canals through which its freight must take its way to market, viz., the State Canal, which joins the navigable Delaware at Bristol, and the Morris Canal, which traverses the State of New Jersey, debouching on the Hudson at Jersey city. The transport capacity of the former is estimated at 900,000 tons per annum, and the maximum amount that the latter canal could convey may be taken at 400,000 tons. These two estimates together give a means of transport for 1,300,000 tons from the Lehigh district, which it is possible may be carried by the Lehigh Navigation Company, at a moderate expenditure for additional craft, working expenses, &c. Any freight above that tonnage would require an enlargement of their own canal, and also that of one or both of the outlets,—the State Canal and the Morris Canal.

The estimated capacity of the Schuylkill Navigation Company may be taken at 800,000 tons, which by a moderate expenditure for additional boats, &c., may be increased to 1,000,000 tons, any increase beyond this would require more water, which would necessitate a considerable outlay for the construction of dams, reservoirs, &c., to provide for a sufficient supply of water during the dry season. By these means an additional power could no doubt be obtained.

The Reading Railroad, with its present rolling stock, is capable of carrying 2,000,000 tons, and by increasing its powers by means of additional trucks, engines, wharves, stores, &c., it is stated that double that tonnage might be carried without any derangement to the other regular traffic of the line. Additional parallel tracks might also at any time be laid down to meet an increase of coal traffic, each line with its supply of engines, trucks, &c., being capable of providing for 2,000,000 of tons.

The Delaware and Hudson, and the Pennsylvania Coal Company, are both limited in their capacities. The mining operations of the first are at Carbondale, from which a railroad runs to Honesdale, the shipping point on the canal; the estimated capacity of this railroad is given at 550,000 tons. The line is sixteen miles in length, and is what is called a "gravity road;" that is, the coal is raised to a certain height up an inclined plane by means of a stationary engine. From the point thus gained the road is constructed for some distance with a descending grade sufficient to move the trucks along by their own force of gravity; then another inclined plane occurs with its stationary power, and a new descending slope, and so on to the terminus at the shipping port on the canal. Four trucks, of 3½ tons each, are drawn up the incline at once, and the average number of turns is 120 per day.

The Pennsylvania Coal Company's railroad, from Pittston to Hawley, their shipping port on the same canal, is also a "gravity road," forty-four miles in length, with ten inclined planes on the empty-truck line, and twelve on the loaded-truck track, each plane being from 1700 to 2000 feet in length. All are worked by stationary power; three are worked by water power and the others by steam. Altogether there are required to work this line forty-eight stationary engines of thirty horse-power each. The road, too, is carried in several places for great distances on high tressle work, being both expensive and difficult to keep in order, and the gradients are very steep, thus preventing any great alteration in, or increase to, their present carrying capabilities, which are estimated at a maximum of 450,000 tons per annum.

The aggregate *maximum* capabilities, therefore, of the present companies appear to be,—

	Tons.
Lehigh Navigation Company ..	1,300.000
Schuylkill Navigation Company ..	1,000,000
Reading Railroad	4,000,000
Delaware and Hudson	1,000,000
	7,300,000

The gross quantity of coals conveyed by them to market in 1851 was (deducting the tonnage sent down the Susquehanna) in round numbers 4,000,000 tons. Assuming the ratio of increase already given to be sustained, of which no reasonable doubt can be entertained, the supply required to meet the demand of 1856 will be between 8,000,000 and 9,000,000 tons, for the conveyance of which the existing companies have only capacity for about 7,000,000 tons. The new lines of railway now in progress will probably be sufficient to supply this deficiency in carrying power, but then in another five years provision must be made to meet the compound increase which will then, in the ordinary course of the trade, have accrued. Such a rate of increase appears to me to be likely to be sustained from the following considerations.

Hitherto the New England States have been selected as the site of different manufacturing establishments, and, indeed, as the seats of extensive and important industries, principally on account of the large amount of water power they contain, and to which it has been found economical to bring the raw material to be manufactured. A considerable expenditure is thus occasioned by the carriage of the raw materials, the produce of other States (often very distant), and by the re-transmission of them when manufactured to their several markets. The increased knowledge of the anthracite districts of Pennsylvania, and the prospect of increased facilities for working them, and distributing their produce both westward and eastward, appears to me likely to affect this state of things. The manufacturing industry of the States is generally in a state of rapid progression, and, consequently, it becomes the interest of each manufacturer to secure for himself such advantages, whether natural or produced, as will enable him most successfully to compete with others. In such case, in selecting a site, proximity to a good coal market would doubtless be considered (*cæteris paribus*) as an object of great importance. Several large manufacturing establishments are already in existence, and others are contemplated in districts where the exploitations of the few last years have developed advantages, as regards natural sources of power, far greater than those possessed by the New England States. As competition becomes keener in these markets, these physical conditions affecting industry will become more apparent. Hence it appears to me that from this source the demand for coal must greatly increase, and will, in fact, keep pace in a great measure with the progress of those branches of manufacturing industry in which the United States has, during the present generation, been making such rapid strides.

Even in the New England States I am much inclined to think that coals will ere long, under a more favourable mode of access, compete in many localities as a means of power with that with which nature has so bountifully supplied them. As domestic fuel, both there and elsewhere, coals must find a largely increasing consumption, not more from the superior comfort they furnish, than from the rapidly decreasing supply of wood in all the populated districts. The applicability of anthracite fuel for marine engines is now, I believe, fully admitted; and every year, while increasing the area of consumption in the shape of additional steam-ships, will tend to remove the doubts as to its suitability which have hitherto been obstacles to its use.

Without attempting to draw any deductions from data so imperfect as that which I have been able to obtain, especially in a case like this in which such important interests are concerned, it is still impossible to refrain from noticing the important connection between fuel, as a source of power, and the development of industry generally. Its range is susceptible of extension, and its powers of increase, wherever coal is abundant; and in like manner must its range be limited and its powers irregular, either when the supply is naturally deficient, or when, through inadequate means of transportation, it is unequal to meet the requirements of the market.

Although the coal formation existing in the State of Maryland has been roughly estimated as covering an area of 550 square miles, the only portion which at present has any economic importance is that lying high up in the valley of the Potomac, and known as the Frostburg or Cumberland coal field. It occupies an area of 150 square miles, having an average length of thirty miles, and an average width of five miles. The increasing demand for steam coals has latterly given a great stimulus to the coals of this basin, which are of a free-burning or semi-bituminous character, and were very highly spoken of by Professor Johnson, in his Report to the United States'. Secretary of the Navy (1844), on the evaporative power of coals, &c. The coal is all sent down either by the Potomac, by the Chesapeake and Ohio canal, or by the Baltimore and Ohio railroad, to Baltimore, a distance of nearly 200 miles. This distance from the market occasions a cost of $2 30c. per ton, for carriage, which necessarily militates considerably against any very great extension of its markets. Besides which it is, like most of the free-burning coals, of rather a soft nature and suffers much from being shifted, furnishing after carriage only about forty per cent. of solid coal, suitable for the supply of steam-ships. The screenings, or small coal, are sold at 50 cents per ton less than the other. There are several mining companies in active operation. The failure of one of the largest, the Maryland Mining Company, in the early part of 1852, tended to give a check to the trade, which although very satisfactory, would probably have shown a still greater increase.

The following statement shows the amount of coals sent to market annually from 1845, when the regular trade may be said to have commenced, to 1852.

		Tons.			Tons.
1845	..	16.000	1849	..	71,699
1846	..	18,393	1850	..	146.645
1847	..	50.259	1851	..	163.855
1848	..	60,289	1852	..	256,000

Previous to these dates considerable quantities of coals were mined and consumed in the line of carriage, but a very small tonnage reached Baltimore, until Professor Johnson's Report made known their economic value for steam purposes.

I found it a matter of great difficulty to obtain any reliable information in reference to the coal production of that portion of the Great Alleghany coal field, lying west of the Mountain Chain, in the states of Pennsylvania, Ohio, and Virginia, as no statistics are kept, and the districts are so widely separated that the inhabitants of either scarcely know what operations are being carried on beyond their own immediate vicinity. Considerable care was taken in collecting the following information, and the source from which it was obtained induces me to believe that it approximates pretty closely to the actual quantity which was obtained for market in the year ending December 31st, 1852.

	Bushels.		Tons.
Western Pennsylvania ..	35,000,000	or	1,170,000
Virginia	15,000,000	„	500,000
Eastern Ohio	16,000,000	„	535,000
Making an aggregate of	66,000,000	„	2,205,000*

These coals are all bituminous.

I could not arrive at any very satisfactory determination as to the relative proportions used for the several purposes of manufacturing, or domestic consumption, and for the use of steam-boats.

The principal markets besides Pittsburgh and its vicinity are Cincinnati, Louisville, St. Louis, and New Orleans. It is also distributed in smaller quantities at all points upon the Ohio, and also upon the Mississippi, from St. Louis to New Orleans. All competent authorities agree in estimating the rate of increase of consumption at 25 per cent. per annum; the portion used for domestic purposes probably would show the greatest ratio of increase, as wood is becoming extremely scarce in many of the districts referred to.

Samples of coal from Valley Falls in Rhode Island were exhibited in Class I., having the character of an altered anthracite, and in fact having very much the appearance of a coarse graphite. They were sent by the Blackstone Mining Company, whose operations, upon a limited scale, are carried on at Valley Falls, about six miles south of Providence, and not more than two miles from tide water. The coal does not appear to possess any high economic value for domestic purposes; its difficulty of ignition will always be a barrier, while the large per centage of ash, which, according to the State Geologist's Report,† it contains, lowers its value as fuel for any industrial uses. At the same time the mining operations are rendered more costly, owing to the irregularity of the beds of coal, occasioned by the disturbed and metamorphosed state of the district generally. The market for the fuel, which is at present limited both in quantity and in range, is susceptible of increase to any extent, should any beds be discovered possessing more of those characters of anthracite coal, which is now so extensively used in all the Atlantic States.

The deposit of coal in the oolitic formation which occupies a considerable area in the eastern part of Virginia and of North Carolina, was well represented in the Exhibition. This offers many points of interest to the geologist, while to the industry of those and the neighbouring States, it is daily increasing in importance. The area occupied by the formation extends in length about fifty miles, by an average width of ten to twelve miles west of Richmond in Virginia, occurring again at Deep River in North Carolina, and running with some interruptions nearly across the entire breadth of the State.‡

In Virginia where this formation has been carefully surveyed, its thickness is given at 800 feet; the coal seams being confined to the lower 150 feet. In some localities two or three seams are known, but in the basin south of James River, these appear to be united into one great bed of from twenty to forty feet in thickness.

The quantity of coal annually sent to market from this basin may be estimated at 150,000 tons.

Less is known of the North Carolina deposits, which have not received the same attention, their economic value being considerably diminished by the want of means of transportation. These, however, will shortly be furnished by the completion of the slack-water navigation of Deep River.

COALS—*Gas.*—(CLASS I.)

The consumption of coals for gas purposes is largely on the increase. On the seaboard a large proportion is obtained either direct from Great Britain or from the bituminous coal deposits in the British North American Colonies In the Atlantic States, south of New York, the oolite coal field of Virginia furnishes a portion of the necessary supplies, the remainder being generally obtained from this country. In the States west of the Alleghanies, the entire supply is obtained from the nearest coal field. The establishments that I visited were those of Boston, Newhaven, New York, Philadelphia, Baltimore, Cincinnati, and Chicago. In every case I met with the greatest attention, and every opportunity was readily afforded me for obtaining the information I sought for. The superintendents were perfectly well acquainted with every improvement which has recently been made in the working of gas-houses, and in many cases I found had adopted them. Owing to the expenses attending the transport of the raw materials, and the difficulty in disposing of the secondary products, the prices charged for the gas are in general very much higher than our own. In all cases, however, where I had an opportunity of inquiring, I found that a reduction in the selling price had been immediately followed by an increased consumption. The common ⌓ shaped iron retort was in general use. In one or two establishments, clay retorts had been tried, but had not worked so well as the others; these, I am inclined to think, will make another trial, especially as the rise in the price of iron makes the difference in outlay of more importance.

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* *Anthracite* coal is sold by the gross ton of 2,240 lbs.; *bituminous* coal by the bushel of 80 lbs.

† C J. Jackson's Report, 1840.

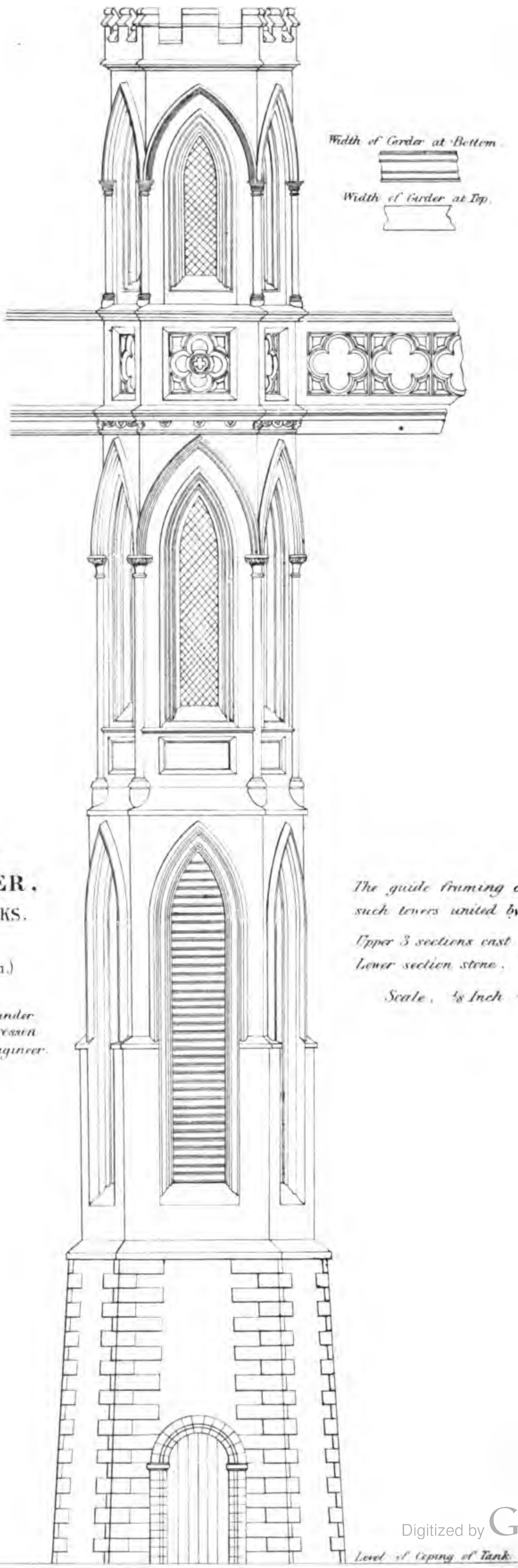
‡ Sir C. Lyell, On the Coal Field of Eastern Virginia.—*Geol. Trans.* vol. iii. part 1.

The following summary of details of manufacture, in the principal establishments visited, I have given separately, rather than in a tabular form:—

1. *Boston.*—Corporation a Joint Stock Company. Aggregate make in 1853, 130,000,000 cubic ft.; price to consumer, \$2 50c. per 1,000 ft., being a reduction during the year of 50c.; increased consumption very perceptible. Public lamps are charged 1c. per hour; are lighted and cleaned by the Company, and average from 2,500 to 2,700 hours a-year. All private consumers are supplied by meter, either wet or dry; the wet meter principally used. The coals used are the Pictou, combined in different proportions at different times, with the Hillsboro', N.B. (a highly bituminous coal), the Blackheath cannel, and the Scotch cannel. All the secondary products meet with a ready sale.

2. *New York.*—Manhattan Gas Company, Joint Stock Company with paid up capital of \$1,200,000.—Charter of Incorporation grants the liberty of supplying all the city above a certain line (Grand-street); the New York Gas Company furnishing the exclusive supply to that portion of the city below Grand-street. Make in 1852, 209,000,000 ft.; expected to increase to 300,000,000 in 1853. Present price to consumers, \$3 per 1,000 ft., originally (1834) charged \$7. Each reduction was followed by an increased consumption. The price was reduced 25 per cent. in two years, and consumption in consequence very nearly doubled. The surplus profit over 10 per cent. on the capital devoted to reduction in price: expect to be able to make a further reduction shortly, as the consumption is rapidly increasing. Contract for street-lamps at present very low and unremunerative, being only \$15 per annum for an average consumption of 23,000 ft., the Company lighting, &c. As the buildings increase, and the streets become covered, this will probably become more remunerative. The coals used are all English, one-third Newcastle and two-thirds cannel. Average cost, delivered on wharf, \$12 per ton. Iron retorts are used, set in the usual way, either in fives or sevens; clay retorts have been tried, but did not stand; three gave out in two months, and one has now been in use ten months. Average yield obtained, 9,500 ft. per ton. Secondary products meet with a limited sale; coke at $6\frac{1}{2}$ c. per bushel; gas liquor contracted for at \$800 per annum; coal tar, a sale for, occasionally at $37\frac{1}{2}$c. per barrel; the lime costs 4 c. per bushel, the old stuff being taken away and sold at a small price for agricultural purposes. The men employed were foreigners, chiefly Irish; the wages paid were, to firemen, \$$9\frac{3}{4}$ = 2*l.* 0*s.* 8*d.* per week; labourers, \$1 12c. = 4s. 8d., and mechanics, \$2 per day.

3. *Philadelphia.*—Municipal Corporation—Capital invested, \$1,400,000, originally commenced and carried on as a private undertaking, and subsequently purchased by the City; its direction and general government being vested in a board of trustees, by whom it has been carried on since that period. I had the advantage of being taken over the old works, and also the magnificent erection then just being completed for their new establishment by Mr. F. Fraley, the President of the Board of Trustees, and by Mr. Cresson, their engineer, under whose management the works have reached their present state of prosperity and efficiency, and under whose superintendence the new works have been erected.



GUIDE FRAMING
OF NEW GASHOLDER.
PHILADELPHIA GASWORKS.

(160 feet diam. by 90 feet high.)

Erected from the designs and under
the superintendence of John C. Cresson
Engineer.

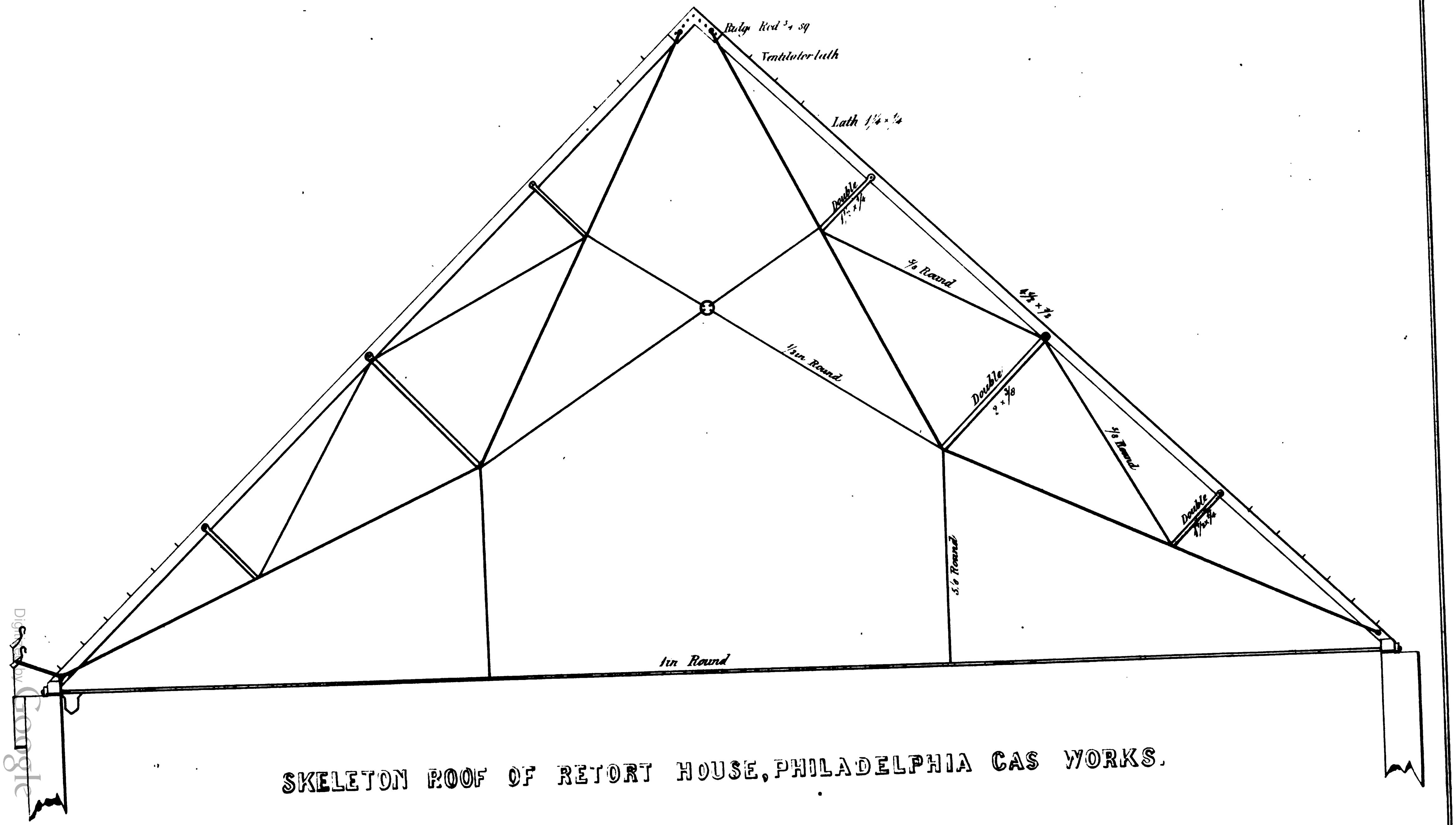
The guide framing consists of 12
such towers united by girders.

Upper 3 sections cast iron.

Lower section stone.

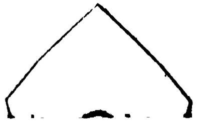
Scale. ⅛ Inch = 1 Foot.

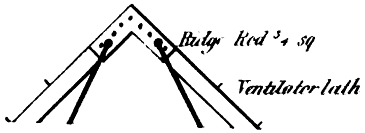
Harrison & Son, Lithe. 45 St Martin's Lane, London



SKELETON ROOF OF RETORT HOUSE, PHILADELPHIA GAS WORKS.

TELESCOPE GASHOLDER AT THE PHILADELPHIA GAS WORKS.




Ridge Rod ¾ sq
Ventilator lath

These are remarkable, not more on account of their magnitude than on account of the combination of engineering skill, with ornamental finish, which Mr. Cresson has displayed in their arrangement. As I believe we have never ventured upon a gasholder of such magnitude in this country,* and as some novelties in construction have been introduced with perfect success into this one, I obtained through the liberality of Mr. Cresson drawings of the principal parts of his gasholder, with full and descriptive working details, which I have now given.

Description of Gasholder at the Philadelphia Gas Works.—The following are the dimensions and working details of the great telescope gasholder at these works. It is 160 ft. in diameter, and 90 ft. high, with 12 guide towers built of cast iron and stone, in an ornamental form, of which a drawing is given. The *inner or upper section* is 158 ft. 6 in. diameter and 45 ft. deep, (20 rows of sheets, 16 rows of No. 12, 2 rows of No. 11, and 2 rows of No. 10.

$$\left.\begin{array}{ll}\text{Bottom angle iron,} & 3'' \times 3'' \times \frac{1}{2} \\ \text{Outer} \quad ,, & 3'' \times 3'' \times \frac{1}{2}\end{array}\right\} \begin{array}{l}\text{Cup, No. 10 sheets and butts, 20 in.} \\ \text{deep and } 6\frac{1}{8} \text{ wide in the clear.}\end{array}$$

24 legs of cast iron, each in five lengths.

Top curb (angle iron), $4'' \times 4'' \times \frac{5}{8}$; 3 rings of angle iron at equal distances, $2''\frac{1}{4} \times 2\frac{1}{4} \times \frac{1}{4}$.

48 guide-plates, rivetted to legs with hot rivets $4 \times \frac{1}{4}$.

Crown, straight rise of 4 feet to centre.

Crown-plate, 4 ft. diameter by $\frac{1}{2}$ in. thick; 16 rows of sheets; crown-rows Nos. 8 and 10; rest No. 12, except the outer which is No. 11.

King-post, No. 3, boiler iron, 25 ft. long and 30 in diameter; top ring, $4'' \times 4'' \times \frac{1}{2}$; bottom ring, $4 \times 4'' \times \frac{1}{2}$.

Two rings for nut at end of bolt, $4'' \times 1''$; bottom plate, $\frac{3}{4}$ in. thick.

All bolts and nuts for crown end of bars, $1''\frac{1}{4}$.

Crown to be on 7 rings of plate and angle iron.

No. 1 plate, $3'' \times \frac{3}{8}$. No. 2 angle, $3'' \times 3'' \times \frac{3}{8}$. No. 3 plate, $3 \times \frac{1}{2}$. No. 4 double angle, T $3 \times 3 \times \frac{3}{8}$, so arranged as to break joint. No. 5 plate, $4 \times \frac{1}{2}$. No. 6 angle, $3 \times 3'' \times \frac{3}{8}$. No. 7 plate, $4'' \times \frac{5}{8}$.

All plate-rings secured at the joints with butt plates.

24 trusses of round and square bar iron, each truss having 7 struts. On 1st and 2nd ring, $1\frac{1}{4}$ in. square; on 3rd ring, 1 in. square; on 4th (main strut), bars of $3'' \times \frac{3}{8}''$, rivetted at distances of 1 foot, and blocked apart with $\frac{7}{8}''$ washers; on 5th and 7th, double struts of 1 in. square bars; on 6th, double struts of plate; each leg two bars of $2'' \times \frac{1}{4}''$, similarly secured with No. 4, (see drawing) round iron tension rods of sizes, marked in drawing.

The crown to be enclosed in a wrought railing 16 in. high; 2 rails of 1 in. round iron, and secured to the outer angle iron by 48 stauncheons braced with $48\frac{1}{2}$ in. round rods.

Lower Section.—160 ft. diameter, and 45 ft. deep; sides, 20 rows of sheets (17 rows of No. 14; 1 row of No. 11, top row No. 10, bottom row No. 12.)

Cup, same as upper section; bottom angle, iron $3'' \times 3'' \times \frac{1}{2}''$.

24 rollers and carriages on the cup between the sections.

24 ,, ,, ,, on guides.

36 hooks for suspension from the tanks.

Aggregate make (1852), 232,000,000 ft.; present price $2 per 1,000 ft.

Street-lamps charged $20 per annum; average consumption of each, 28,000 ft; the city lighting, &c.

The coals used are the oolite from Richmond, Virginia; the West Pennsylvania coals from Pittsburg; the Pictou; and English, from Newcastle and Wigan, in various proportions, giving an average produce of 4 c. feet per lb. of coal. The Richmond coal yields from 3·92 to 4·5 feet per lb.

The secondary products are not very remunerative; gas tar is readily saleable at 50c. per barrel of 30 gallons; the coke meets with a heavy sale at 5c. per bushel; the lime costs 3c. per bushel, and sells readily to the farmer at the same price; the ammonia liquor is given or thrown away.

Labourers chiefly Irish and German; wages average about the same as in New York.

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* Since the above was written, I find that the Imperial Gas Company have erected a large telescopic gasholder at Kennington, 160 feet wide by 70 in depth; and I am informed that it is intended to construct one at their works at Fulham 250 feet in diameter.—I. W.

4. *Baltimore.*—Joint Stock Company. Annual make about 70,000,000 cubic feet; the present price to private consumers is $3 per 1,000 ft., all burnt by meter; supplied without charge by Company: price reduced last year $1 50c. per 1,000 ft,, and consumption increased already 33 per cent. Street-lamps charged $22½ per annum each, for an average supply for 2,250 hours; the city lighting, cleaning, &c. The coals used are English (Wigan), one-third; Virginia, two-thirds, giving an average yield of 4 feet of gas per lb. of coal. The Fairmount coal from Virginia, on recent trial, gave 4·75 feet per lb. Secondary products disposed of with difficulty; coke at 8c. per bushel; gas tar at $1 per hogshead, and the ammonia liquor at $10 per ann.

Labour performed by Irish; wages about the same as at New York.

5. *Cincinnati.*—Private Joint Stock Company; few shareholders; paid up capital, $110,000; established 1841. Present annual make about 40,000,000 to 50,000,000 cubic feet; price to private consumers, $3 per 1,000ft.; reduction of price not followed by adequate increase of consumption; a recent reduction of 15 per cent. only gives an increased consumption of 2 per cent. Street-lamps are charged at the rate of $19 28c. per annum each for a supply averaging 2,000 hours; the city finding labor for lighting, &c. The coals used are Pittsburg four-fifths and cannel from Virginia one-fifth; yielding upon an average 4·2 feet of gas per lb.

Secondary products.—The tar has a ready sale at $2 per barrel; coke sells heavily at 5c. per bushel; ammonia liquor is run off into river; lime costs 20 c. per bushel; no sale for it.

Labourers chiefly foreign, Irish and German; wages $30 to $45 per month.

6. *Chicago.*—Joint Stock Company. Annual make from 20,000,000 to 25,000,000. Present price to private consumers, $3 50c., with 5 per cent. discount. Street-lamps are charged by meter at $2 50c. per 1,000 ft.; Pittsburg coal only used; average yield, 4 feet per lb. Secondary products—coke meets with a quick sale at 12½c. per bushel; gas tar sold by contract at $1 per barrel, and is largely used for roofing purposes. An advance will be obtained when present contract expires. Lime costs 25c. per bushel; no sale for it; gas liquor thrown away. Labourers, chiefly Irish, at wages of about $1 per day.

The following list gives the prices charged per 1,000 feet in the most important cities:—

	$	c.
Philadelphia (Municipal Corporation) ..	2	0
Pittsburgh	2	10
Boston	2	50
Cincinnati	3	0
Louisville	3	0
New York	3	0
Baltimore	3	0
Cleveland	3	0
Columbus	3	0
Wheeling	3	0
Newark	3	50
Brooklyn	3	50
Chicago	3	50
Richmond	3	50
Philadelphia (Northern Liberties) ..	3	50
St. Louis	3	50
Buffalo	3	50
Hartford (Connecticut)	4	0
Newhaven	4	0
Providence	4	0
Troy	4	0
Albany	4	0
Nashville	4	0
Charleston	4	0
Washington..	4	0
Mobile	4	50
New Orleans	4	50
Savannah	5	0
Springfield	6	0
Augusta	7	0

IRON.—(CLASS I.)

Iron.—The peculiar geological features of the United States, evidenced by the enormous development of its older formations, and the comparatively small area occupied by the secondary and tertiary beds, at once indicate the probable possession of mineral wealth. And such is the case. The indication has held good throughout the country, and each State that from time to time becomes important enough to be added to the Federal Union, brings with it a dower not more valuable from the surpassing fertility of its surface acres than from the hidden riches that lie beneath them. Wisconsin, Iowa, and California have already earned a standing in the annals of mineral industry, and the excellent Report of Dr. D. Dale Owen has made known to us what may be expected from the territories of Minnesota and Nebraska.

The distribution of the various metallic minerals in the different States is somewhat irregular, as may be readily conceived; the rarer metals, as gold, being found but in few localities; tin only to a limited extent, in one place; lead and copper, which are found generally associated together, and occurring to a greater or lesser extent in most of the States, while, happily for the country, iron is met with everywhere, in some places forming deposits of enormous magnitude, and in others, compensating for its diminished quantity by the richness of its ores. To describe these as fully as they deserve—for some of them possess features of peculiar interest, both in a geological and mineralogical point of view—or to attempt to show their connexion with, and their bearing upon, the great industrial interests of the country, would lead me beyond the limits of a Report, which I wish to be considered rather as representing the present state of the iron industry, than as recording its general history or describing the various elements upon which it is based. The importance of these points, however, as auxiliary to, and prefacing the principal object of the Report, renders a brief notice of them perhaps desirable.

The ores found in the States comprise every variety known in Europe, save, perhaps, that of our own country, the "blackband." Those principally used for smelting are the magnetic oxides, the hæmatites, and the clay carbonates of the coal measures; besides these, the "spathic," or "sparry corbonate," and the "oligist" or specular iron ore are used, but at present only to a limited extent. The magnetic oxides and the hæmatites are dispersed pretty generally throughout the whole extent of the Union, from Maine to Texas, and from the Atlantic seaboard to the States of the far west. The clay carbonates are associated with the coal measures lying west of the Appalachian chain. In general they are not so rich as those in our own country, but when mixed with the hydrated hæmatites, which are met with skirting the coal districts, these lean ores are very advantageously worked up. They are also found in considerable deposits on the Atlantic side of the mountain chain, in Philadelphia, Maryland, Virginia, and North Carolina. The spathic ores are not met with to any great extent; they are found in different localities in Connecticut, and in Vermont, and when worked in the old method with charcoal and the ordinary cold blast, they furnish iron of first-rate quality. The specular iron ores occur in the New England States, and in New York State to a limited extent; in the more distant States, both of the South and West,—Texas, Arkansas, Missouri, Iowa, and California they are reported to be present in great abundance.

The very general distribution of iron ores throughout the Union, and the abundance of fuel which the natural forests everywhere readily supplied, gave facilities for the manufacture of iron, which in the early days of the Industry was carried on in various parts of the States, and in many formed the only sources from which the inhabitants could obtain their scanty supplies. Possessing in common with the other States both of the raw materials,—the ores and the fuel,—the New England States, owing to the advanced education and general commercial energy of her people, led the way in identifying themselves with the new industry, by forming establishments where it was carried out on a more extensive scale. Gradually, however, the existence of mineral fuel in Pennsylvania gave an advantage to that State which soon showed itself by the rapid growth of her iron industry. This continued annually to increase, while the scarcity of fuel in the New England States rendered them less able to meet the increasing demands of the market which they themselves had principally created. In 1830, anthracite coal was successfully used in smelting ores, and when, some few years later, it was shown that the hot blast could be as advantageously applied to anthracite as to other furnaces, this State became at once the great centre of the industry, and speedily assumed the control of the home market. This position she has held up to the present time, and must hold it for some years to come, until the iron-making resources of the States west of the Alleghanies are sufficiently developed to enable them to compete in production with their more advanced neighbours.

These great resources are as yet but very imperfectly known; geological investigations have long ago made known the existence of beds of fuel to a boundless extent, and so disposed as to offer natural facilities for working which cannot be without their results on the industrial uses to which they are applied. With these beds are associated, probably throughout the greater part of their area, beds of ironstone similar to that which we find in the coal measures of our own country. These give to this region a material advantage over that east of the mountain range, where the coal formation is entirely destitute of the ore beds which seem to be so bountifully distributed throughout the great bituminous coal-field on the western side. Thus while the smelting furnace in the one district finds a ready supply of both ore and fuel immediately at hand, the location of the other has to be determined by calculations based upon the comparative cost, and other circumstances attendant upon the transport to the furnace of the two necessary materials, the fuel and the ores. These points I shall have occasion to allude to in the following details of the Industry which I have been able to collect, and which will I think tend to show the importance of the future prospects of iron-making in the States alluded to.

The manufacture of iron has hitherto distributed itself on the line of the great rivers, which are the natural feeders to the canals by whose medium the produce has been conveyed to the consuming districts. Thus we find the chief seats of the iron manufacture to be:

1 - - On the Houseatonic River
2 - - „ Hudson River.
3 - - „ Delaware and Lehigh Rivers.
4 - - „ Schuylkill River.
5 - - „ Susquehanna River.
6 - - „ Potomac River.
7 - - „ Ohio River.
8 - - „ Cumberland and Tennessee Rivers.

These we will take in order.

1st. *The Houseatonic* is a river of some importance which traverses the State of Connecticut, and owing to its water power, furnishes advantageous sites for many manufactories. Its banks are covered with an abundant growth of timber wood and extensive deposits of hæmatite are scattered along its shores. More recently, the discovery of a large bed of the spathic iron-ore at Roxbury and at Munro have added to the mineral resources of the district. Its distance from the coal fields of Pennsylvania, however, limited its production to charcoal iron, which was of the best quality, and even to this day the Salisbury iron has a high celebrity in the market, and is much sought after for various purposes for which tenacity is required, such as the manufacture of harpoons, &c.

The general introduction of anthracite coal for smelting purposes, and the consequent increase of furnaces in more suitable localities, have, as a matter of course, limited the market range for this description of iron.

The present make of this division cannot be estimated at more than 10,000 tons per annum, which are consumed chiefly in the immediate districts in the manufacture of cast-iron railway wheels, malleable iron castings, &c.

2nd. *The Hudson River* traverses the State of New York in a line nearly parallel with the Houseatonic River. Upon the line of the Hudson, and its extension by the Northern Canal to Lake Champlain, a large and very important production of iron, by anthracite coal, is rapidly springing up.

Here we begin to see the effects produced by the approximation of the two elements necessary for a successful iron operation, the ores and the fuel. At Rondout, on the Hudson, is the termination of the Delaware and Hudson Canal, which, commencing at the northern extremity of the great Wyoming coal-field, brings down the produce of the Lackawanna basin to tide water on the Hudson, a distance of 110 miles. By this route, anthracite coal can be delivered along the line of the river at an average rate of $3 50c. per ton.

Ascending the river northward, we come upon those enormous deposits of ore, the rich magnetic oxide, which are traced for miles along the western side of Lake Champlain. These ores [iron 71·79, oxygen 28·21, or 31 parts of protoxide, and 69 of peroxide] which are the richest of all, yielding from 60 to 65 per cent. of metal in the furnace, can be mined and delivered to the coal on the Hudson, at an average cost of $3 per ton. To the eastward of the Hudson, lying between that river and the Houseatonic, we come upon the extensive hæmatite deposits which I have before mentioned as furnishing the ores for the furnaces in that division,—and some 25 to 30 miles below Rondout, the river cuts through the first great mountain ridge (metamorphic), which along its whole course contains extensive beds of rich primitive ores, containing small proportions of manganese or zinc, and bearing a close resemblance to those of Sweden and Norway.

This combination of circumstances, effected at a comparatively low cost, when we consider the physical obstacles in the path of a successful iron operation in the Atlantic States, is now beginning to produce its results. Already upon the line of the Hudson are 6 large anthracite furnaces, on Lake Champlain 3 more are in active operation, although I believe the chief production in that district is with charcoal, the ore being made direct into iron in a kind of Catalan forge or bloomery. The rich ores of Lake Champlain allow this rough mode to be still carried on advantageously, although it requires on an average 4 tons of ore and about 300 bushels of charcoal to produce 1 ton of blooms. In the anthracite blast furnaces, these ores are said to work up well by themselves, without the admixture of any leaner ores, and as may be readily understood, with a less consumption of fuel,—from 1·3 to 1·5 of coal being sufficient to produce 1 of metal.

These advantages all tend to reduce the cost of anthracite iron-making in the Hudson district, which I have every reason to believe can be made on tide water at an average of $18 per ton. The quantity made is rapidly increasing, the returns for the current year, 1853-4, I am informed, will not be less than 80,000 tons.

3rd. *The Delaware and Lehigh.*—The Delaware is the next great river south of the Hudson. This takes a somewhat curved line, in a direction from north to south, separating the State of New Jersey from Pennsylvania, and emptying itself into the Atlantic at Cape May, where it widens out considerably and forms Delaware Bay. About 180 miles up the river is situated the city of Philadelphia, and at the distance of about 90 miles more is Easton, situated at the point of junction of the Lehigh River with the Delaware. The Delaware then proceeds northward, cutting through the same mountain ridge as the Hudson, and traversing a poor agricultural country, while the Lehigh, branching out in a south-west direction, leads straight up to the north-east extremity of the first great anthracite basin, known as the "Schuylkill," in which its head waters are found. At a very considerable outlay by the Lehigh Coal and Navigation Company, amounting to something like $12,000,000, this river has been rendered navigable from Mauch Chunk down to its junction with the Delaware at Easton, a distance of 50 miles; and from Easton, a water communication exists with Philadelphia by means of the State canal; and also with New York by means of the Morris canal, which traverses the State of New Jersey, and debouches on the Hudson at Jersey city, opposite the city of New York, a distance of 110 miles. Another means of water communication between the Delaware and the Hudson, is by the Delaware and Raritan canal, which, with the other, has been more fully described in reference to the Coal Industry, (see page 22). Besides these canals, a railroad has been also completed down the line of the Delaware, and two others are now in progress up the Lehigh valley. Easton, which lies at the point of water junction, is about equi-distant from the anthracite coal-field of Pennsylvania and the primitive ore range of New Jersey—say about 40 miles each way—while all around the country extensive beds of hæmatite are met with, which work well in the furnaces, and yield about 40 per cent. of metal.

In this district I had an opportunity of visiting the most extensive and most successful iron-works in the United States. With conditions as regards ores and fuel, from locality even more favourable than those I have just described on the Hudson, I think there cannot be a doubt that iron can be made on the Lehigh at as cheap a rate as at any other spot in the Atlantic States.

At the establishment of the Trenton Iron Company at Easton, I found three large furnaces in operation, two of them having a diameter of 20 feet, and one recently erected with a diameter of 22 feet, giving an average production of 500 to 600 tons per week. In looking over the working returns of the furnaces, all of which were most liberally exposed to me by the managing partner, I found some extraordinary runs, amounting to upwards of 240 tons per week from the 20 feet furnace, and continuing at that rate for several weeks together. The furnaces were not running so well when I visited them, owing to the presence of a large proportion of zinc in the ores they were then working, which had the tendency to check the reduction of the ores by cooling and clogging up the fires. The Andover (New Jersey) ores (magnetic oxide), which are largely used by this company, have been long celebrated for the superior quality of the iron they produce. A large portion of that now made is manufactured into wire by the company, at their rolling mills at Trenton.

At Whittaker's there are 2 small furnaces, producing from 200 to 250 tons per week.

Higher up the river are situated the works of the Glendon Iron Company. These contain 4 large blast furnaces, which appear to have been built in a very substantial and compact manner, and on the most improved system; indeed, the whole of the working arrangements seem to have been devised with great skill. In order to economise space in the engine-house, they had placed the blowing cylinders immediately over the steam cylinders of the engine, so that the same piston-rods, by a reciprocating movement, worked the two cylinders at the same time. Thus not only was space economised, which in this particular instance was important, but a considerable saving was effected in friction, and also in first outlay. These works produce, on the average, from 500 to 600 tons per week.

The next works, on ascending the river, are at Allentown, and are carried on by the Allentown Iron Company. Here are 3 large furnaces, producing, on the average, from 400 to 500 tons per week.

At Catasauqua, some 10 or 12 miles higher up, we come to the extensive establishment of the Crane Iron Company. Here I found 5 furnaces in blast, 3 of which were smaller and of older construction than the other 2, having, respectively, diameters of 14 and 18 feet. These were the first furnaces erected in the States for the use of anthracite, and took their name from that of Mr. Crane, who, in 1837, first successfully applied hot blast to anthracite in iron smelting. These furnaces were producing about 600 tons per week.

One more small furnace, known as "Richard's," producing about 80 tons per week, will, I believe, complete the list of blast furnaces in the Lehigh district.

In all those which I visited I found economy of production strictly adhered to: the air was heated by the waste gases of the furnace, and in most cases the whole steam-power, whether for driving the blast or for other purposes, was generated in boilers set in the upper part of the furnace, and arranged so that the heated gases played round them.

The aggregate produce of the district may be taken at 110,000 to 120,000 tons per year; this will probably be increased, as there are 3 more furnaces of the largest class in process of erection.

On the line of the Morris Canal, at Stanhope, are 3 dilapidated furnaces, which were blown out at the time of the depression in the iron-trade. The prospects of iron-making, however, have lately become so improved, owing to the rise in price and steadiness of the markets, that I was informed arrangements had been made to rebuild them, which I believe are now being carried out.

At Boonton, New Jersey, on the canal, there is 1 furnace, making about 5,000 tons per year.

Owing to the advantageous position of the furnaces on the Lehigh, and the scale upon which they are worked, it would appear that the actual cost of making iron there would not exceed from $14 to $16 per ton.

4th. *The Schuylkill District.*—The Schuylkill river takes its rise in the south-western extremity of the 1st Great Coal Basin, known by the same name, and, pursuing an eastward course, runs into the Delaware a short distance below the city of Philadelphia. For purposes of coal transport, its waters have been, at a vast cost, made artificially navigable, and along its banks runs the Reading and Pottsville railroad. Throughout the whole length of the Schuylkill valley large deposits of hæmatite ores are found; these, however, are not so rich as those of the Lehigh; while the supply of the primitive oxides and carbonaceous ores is very scanty. In regard to coals, the two districts have equal advantages, both being in immediate proximity to the supply. The difference in the quality of the ores, and also the different scale on which the smelting establishments are carried on, give a decided advantage in manufacturing iron to the Lehigh district, the cost per ton in this district averaging fully $20 at the works. The following details of making iron on the Schuylkill are thus given by S. J. Reeves, one of the most extensive ironmasters, in a communication to the Committee of Ironmasters:—

	$	c.
2⅔ tons of ore delivered at furnace, at $2 0c. ..	5	33
2¼ tons of coal do. do. at 3 25 ..	7	31
1 ton of limestone do. at 0 75 ..	0	75
	13	39
Labor	2	0
Interest on capital, wear and tear, superintendence, &c.	4	11
Total ..	17	50

This estimate was drawn up in 1850, since which period prices both for materials as well as labour have risen fully 25 per cent.

Upon this river there are in operation 18 blast furnaces using anthracite coal; these furnaces are of smaller capacity than those on the Lehigh—their total production may be taken at 100,000 tons per annum. Besides these, several small charcoal furnaces may be seen in operation, relics of a past iron age still struggling on, until one by one their fires wane away never again to be lighted within the radius of coal transport. Beyond its circle, scattered far and wide throughout the State, these charcoal furnaces are carried on to some extent, and although contributing but little to the gross amount of iron made, still support the character of the American iron by the very excellent article that some which I visited were turning out.

5th. *The Susquehanna.*—This river, another of the great parallel rivers running from the highlands of the interior down to the ocean, is of considerable length, and takes a southern course, until it debouches, just below Havre-de-Grâce, on the upper extremity of Chesapeake Bay. In one portion of its course it skirts for many miles the south-western extremities of the 1st and 2nd coal-fields, the "Shamokin" and the "Schuylkill," while higher up it is divided into two branches, the Northern and the Western, the latter of which traverses the very centre of the 3rd, the great "Wyoming" basin. Along its banks large deposits of iron-ores are met with, and artificial modes of transport, in the shape of canals and railroads, render both those and the coals available for industrial purposes. It offers, thus, very great advantages in the manufacture of iron which, there is no doubt, can be made in this district at a price averaging from $15 to $18 per ton; and in some of the most favourable cases, where the furnaces are in immediate proximity to the ore and fuel, it can probably be made at $2 to $3 per ton less.

The iron industry of the Susquehanna is in a very prosperous state, and its great resources are being rapidly developed. The production of iron is already very considerable; not less than 120,000 tons will be made during the present year (1853-4), the greater part of which finds a ready market west of the Alleghanies.

It would appear from these statements that Pennsylvania furnishes, in round numbers, one half of the whole production of iron in the Union. Within the three districts just described—the Delaware and Lehigh, the Schuylkill, and the Susquehanna—are comprised all the principal works whose produce finds its way into the markets of the country. The other works are pretty generally dispersed throughout the different counties in the States, as out of the 62 counties into which the State is divided no less than 45 actually contained iron works (1851), and of the remaining 17, 9 abound in iron-ore and coal, so that only 8 of the counties can be regarded as not suited to the manufacture of iron. The following are the 10 counties containing the largest number of works respectively:—

Berks	41
Lancaster	30
Clarion	30
Huntingdon	28
Blair	27
Chester	25
Venango	21
Columbia	20
Center	20
Armstrong..	18
Total ..	260 *

These counties represent at present nearly the whole of the iron industry of this State, but according to the opinion of some of those most competent to form an opinion, the greatest seat of the manufacture is destined to be in the north-western portion of the State, at the head waters of the west branch of the Susquehanna, the Sinnemahoning and the Alleghany rivers, a district embracing some of the counties now containing no iron works. This is probably the most elevated tract of country in the State ; at present the streams are all small and only navigable in one direction for short distances, and by shallow craft, and that only during a brief portion of the year. The roads are few and very bad. The whole of this tract of country is covered with a dense growth of very heavy timber, and is underlaid by numerous seams of bituminous coal, iron ore, and limestone, being in fact the north-eastern extremity of the Great Alleghany coal field. The larger portions of the minerals lie above the water level, and are so nearly horizontal in their stratification as to require no steam power to bring them to the surface, nor to pump out the water. Its natural advantages however are so great that few localities offer superior inducements for the outlay of capital.

The entire number of the furnaces and of bloomeries in the State (1850-1) was 304, which were worked as follows:

		Capacity.	Actual make in 1850.
Blast furnaces using anthracite ..	57	221,400	81,351
,, ,, bituminous coal ..	7	12,600	3.900
,, ,, coke	4	12,000	
,, ,, charcoal, hot blast	85	130,706	42,555
,, ,, ,, cold blast	145	173,654	70,727
Bloomeries	6	600	280
	304	550,959	198,813 †

6th. *The Potomac.*—This is the next of the great rivers taking its course some 60 to 100 miles south of the Susquehanna, and running into Chesapeake Bay about midway from the ocean. In this district is included the production of Virginia and Maryland. The district is abundantly supplied with ores, chiefly hæmatites of good quality—charcoal, however, is the fuel chiefly used, although the increasing means of communication with the Cumberland coal field, and also with the anthracite basins of the Susquehanna, have given great advantages in the way of fuel to those furnaces placed within reach of the lines of transport. This will have the effect of inducing the erection of new furnaces to meet the increasing demand in localities where coal can be obtained, as under the present conditions of the market, it is not likely that the make of charcoal iron can any longer successfully compete with it. At present the cost of coal iron in this district may be taken at an average of $20 per ton, while charcoal iron cannot be made at less than $25 to $30 per ton. The gross production of iron of this region may be estimated at 125,000 tons, of which Maryland returns about 100,000, and Virginia about 25,000 tons.

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* See Appendix A.

† For full details see Appendix B, C, D, E, F, G, and I.

From a Report recently published of the industrial resources of the State of Maryland, the following list has been taken, in reference to the production of iron, of the number, location, and capacity of all the blast furnaces in the State. Many of these were idle for several years, owing to the depression in the trade, the great improvement in prices and the increasing demand for iron, have sent them all into blast again.

		Locality.	Capacity.
			Tons.
Lonacoming	1	Alleghany county	3000
Mount Savage	2	„ „	6000
Lena	1	„ „	1500
Anticham	1	Washington	2500
Green Spring	1	„ „	1000
Blue Ridge	1	Frederick county	3000
Catoctin	1	„ „	1500
Elba	1	Howard county	1500
Muirkirk	1	Ann Arundel county	2000
Curtis Creek	1	„ „	2000
Patuxent	2	„ „	4000
Elk-ridge	1	„ „	2000
Nasaongo	1	Worcester county	1500
Ashland	2	Baltimore county	7000
Oregon	1	„ „	4000
Gunpowder	1	„ „	2500
Harford	1	Harford county	1500
La Grange	1	„ „	1000
Sarah	1	„ „	1500
Havre-de-Grâce	2	„ „	5000
Principio	1	Cecil county	2000
Maryland	1	Baltimore city	2500
Laurel	1	„ „	2500
Chesapeake	1	„ „	2500
Cedar Point	2	„ „	5000
Locust Grove	1	„ „	2000
	31		70,500

7th. *The Ohio, and the Cumberland and Tennessee.*—I have placed these two divisions together, as in neither was I able to obtain any satisfactory information as to the details and present condition of their iron industry. Already the demands of western markets are being supplied by western production, which from the best estimates I could obtain, cannot be taken at less than 150,000 tons for the past year. But these are early days to give an opinion upon the iron-making capabilities of the Western States. Their wants may be readily measured by their population, increasing not more rapidly in numbers than advancing in civilization,—with all those demands both in home comforts and manufacturing necessities, amongst which iron in its various applications, occupies such a prominent position. Their capabilities are still only partially developed, but enough is known to show the bounteous manner in which nature has dispersed her mineral stores throughout these States. The enormous area occupied by the Great Appalachian coal field, secures the possession of an illimitable supply of fuel, while the well-defined existence of beds of clay iron ore associated with the coal measures in almost every spot, places the raw material under conditions most advantageous to the manufacturer. These, however, have hardly yet been rendered fully available to iron making—charcoal as fuel and the hæmatite ores, which are found on the outskirts of the coal field, being the sources from which the principal portion of the iron is now produced. Thus at present the cost of making cannot be less than $20 per ton.

In the upper part of the Ohio, in the Pittsburg district, more progress has been made, the furnaces are being worked with raw bituminous coal and with the clay carbonates mixed with hæmatites. These being obtained close at hand, and limestone being found in the immediate vicinity, the expenses of production are considerably lessened, and without referring to the present state of iron making in this region, which has to overcome all those smaller obstacles which present themselves in establishing new methods of manufacture in a new district, I have no reason to doubt that when they become firmly established, iron will be made in this region at a rate below that of any other portion of the Union;—while the distance from the seaboard, averaging 1,000 miles, effectually places it beyond the reach of foreign competition, and leaves it without opposition to supply the demands of the western markets.

Besides the production of these eight principal iron districts, which I have enumerated, a large quantity is made in widely dispersed localities, with charcoal as fuel, in small blast furnaces, or in the primitive forges or bloomeries. These it is difficult to obtain any very accurate information about, either as regards their number, locality, or production. From what I could learn from those best acquainted with the subject, and most competent to give me an opinion, I am inclined to believe that we may safely estimate that about 100,000 tons were produced from these sources during the current year.

If these estimates are correctly formed, we may take the entire production of the States for the year (1853-4), as follows:

	Tons.
In the Houseatonic River district	10,000
„ Hudson River „	80,000
„ Lehigh and Delaware district	120,000
„ Schuylkill „	100,000
„ Susquehanna „	120,000
„ Potomac „	125,000
„ Ohio and Tennessee „	150,000
„ In other districts „	100,000
Total	805,000

This shows a large increase upon the make of the preceding year (1852-3), which did not exceed 500,000 tons. Indeed it has now reached the same returns that it presented before the depression which commenced in 1847-8, and reached its maximum in 1850. The production in that year, as given in the Census returns, is probably estimated considerably too high, as we find from the Report of the Statistical Committee of the Ironmasters' Convention, that the entire make in the State of Pennsylvania for that year was 198,813 tons, whereas the Census returns give it at 285,703 tons, a difference in excess of 86,890 tons, in one State only.

The gross amount of iron produced in the several States of the Union for that year is thus given:

	Tons.
Maine	1,484
New Hampshire	200
Vermont	3,200
Massachusetts	12,287
Connecticut	13,420
New York	23,022
New Jersey	24,031
Pennsylvania	285,702
Maryland	43,641
Virginia	22,163
North Carolina	400
Georgia	900
Alabama	522
Tennessee	30,420
Kentucky	24,245
Ohio	52,658
Michigan	660
Indiana	1.850
Illinois	2,700
Missouri	19,250
Wisconsin	1,000
Total	540,755

The number of hands employed is given at 20,298, and the market value of the produce is estimated at $12,489,077.

The following statement of the iron works built in the United States in each period of ten years previous to 1840, and in each year since that date,—with the failures that took place in each of the last ten years respectively, will give a sufficiently accurate idea of the condition of the industry since its earliest date.

		Blast Furnaces.				Bloomeries.		Total.	
		Coal.		Charcoal.		Forges and Rolling-mills.			
		Built.	Failed.	Built.	Failed.	Built.	Failed.	Built.	Failed.
10 years ending Jan. 1,	1730	..	..	..	..	1	..	1	..
.. ..	1740	..	..	1	..	1	..	2	..
.. ..	1750	..	..	2	..	1	..	3	..
.. ..	1760	..	..	2	..	5	..	7	..
.. ..	1770	..	..	..	..	..	..	..	..
.. .	1780	..	..	3	..	2	..	5	..
.. ..	1790	..	..	1	..	4	..	5	..
.. ..	1800	..	..	9	..	16	..	25	..
.. ..	1810	..	..	11	..	19	..	30	..
.. ..	1820	..	..	14	..	16	..	30	..
.. ..	1830	1	..	18	..	30	..	49	..
10 years ending Jan. 1,	1840	5	..	72	..	46	..	123	..
During	1840	3	..	3	3	6	3	12	6
.. ..	1841	1	..	3	1	2	1	6	2
.. ..	1842	5	2	8	8	7	10	20	20
.. ..	1843	..	1	5	4	2	2	7	7
.. ..	1844	4	6	13	2	4	3	21	11
.. ..	1845	14	..	15	2	11	1	40	3
.. ..	1846	11	1	30	3	12	..	53	4
.. ..	1847	8	1	12	15	5	8	25	24
.. ..	1848	5	5	6	20	6	12	17	37
.. ..	1849	3	5	2	30	5	6	10	41
.. ..	1850	8	..	..	15	5	7	13	22
		68	21	230	103	206	53	504	177

That portion of the tabular statement which relates to the period prior to the year 1840 is chiefly of historical interest. It shows a very singular increase in the number of the works. The course of circumstances influencing the industry is also clearly indicated. The great impetus given to the business about the year 1840 may be attributed to the discovery, two years before, of the successful application of anthracite coal for iron-making purposes. Certain fiscal changes in 1842 produced the curious result of twenty new furnaces erected and twenty failures. The number of new works then steadily increases and the number of failures as steadily decreases until in 1846 they stand respectively at fifty-three new works built and four failures. Other circumstances, commercial as well as fiscal, then appear to have exercised a depressing influence on the trade, as in 1847 we find the failures nearly balancing the number of new works erected; this depression increasing, produced a material effect on the trade, as in the three following years we find that forty new furnaces were erected while no less than 100 works were closed during the same period. It is worthy of remark that the greater proportion of these were furnaces using charcoal.

In the early days of iron-making referred to in the table, we were accustomed to import American iron into this country. During the ten years from 1740 to 1750 the imports averaged 2,360 tons per annum; this quantity increased gradually for the next twenty years, until in 1770 they reached 7,525 tons, being rather more than one-sixth of the entire quantity of all kinds of iron imported into England at that time.

As the country settled down after successfully asserting its independence, and the works of industry were resumed, we find a great advance was made in iron making. In 1810 the number of furnaces in the Union was 153, giving a production of 54,000 tons per annum. From 1810 to 1820 but little progress was made, the trade being in a very depressed state. In 1828 the production had reached 130,000 tons, having been rather more than doubled in the eighteen years. In 1829 it is given at 142,000 tons, showing an increase in one year of nearly 10 per cent. In 1830 it was 165,000 tons, an increase of about 16 per cent. In 1831 it was 191,000 tons; and in 1832 it reached 200,000 tons; thus showing an increase of 70,000 tons, or 55 per cent. in the four years since 1828. In 1840 the census returns give the gross production at 286,903 tons; however, according to the Report of the Committee of the Home League in New York, it was estimated at 347,700 tons. The mean of the two would probably give the safest estimate; this would be 315,000 tons, or an increase equal to upwards of 50 per cent. in the eight years. In 1842 many of the works were closed, and the production fell to about 225,000 tons. In 1846 the gross production was estimated by the Secretary to the Treasury at 765,000 tons, having been trebled in four years; and in the following year it appears to have reached its maximum amount, not less than 800,000 tons being the furnace returns for that year. In 1848, 1849, and also in 1850, from the causes already alluded to, a regular decrease is shown, since which period the trade has again revived, a regular increased annual production has been exhibited, and the returns of the past year present the satisfactory appearance of a rapidly increasing production, already exceeding that at which the trade had arrived previous to its late depression.

Taking the present production of pig-iron at 800,000 tons, about one half of it is consumed for castings, and the remaining portion remains to be converted into wrought-iron, at a loss in waste, &c., of about one-third.*

This for practical purposes reduces the total or available production, about 130,000 tons and leaves, in round numbers, 700,000 tons, to meet a consumption of not less than 1,200,000 tons. This deficiency must be supplied by the produce of other countries.

The number of establishments for the conversion of pig into wrought-iron in the United States is given in the Treasury Returns at 422. They are distributed as follows:—

New Hampshire	2
Vermont	8
Massachusetts	6
Rhode Island	1
Connecticut	18
New York	60
New Jersey	53
Pennsylvania	131
Delaware	2
Maryland	17
Virginia	39
North Carolina	19
Georgia	3
Alabama	1
Tennessee	42
Kentucky	4
Ohio	11
Indiana	3
Missouri	2
Total ..	422

These establishments have an invested capital of between $14,000,000 and $15,000,000 and give direct employment to upwards of 13,000 workmen. The total amount manufactured in the States may be taken at 500,000 tons per annum. In general the wrought iron works are carried on as a distinct business from the manufacture of pig-iron. The only establishments in the United States which combine the whole process of smelting and puddling are:

First,—The Trenton Iron Company, whose blast furnaces are situated at Easton, and rolling-mills at Trenton, both in New Jersey; annually making about 20,000 tons of rails, bars, and wire.

Second,—Fuller and Lord, on the Morris Canal, at Boonton, New Jersey; annual make, about 5,000 tons in nails and spikes.

	$	c.
* 1⅓ tons of pig iron, at $17 50 c.	23	38
2¼ tons of coal, at $3 25 c.	7	31
Labour, per ton	15	0
Interest, wear and tear, and general expenses ..	3	31
	49	0

To which 25 per cent. extra expenditure must be added.

Third,—Reeves, Buck, and Company, at Phœnixville, Philadelphia; annual make, about 15,000 tons in rails.

Fourth,—Reeves, Abbott, and Co., at Safe Harbour, Pennsylvania; annual make, about 15,000 tons in rails.

Fifth,—The Montour Iron Company, Danville, Pennsylvania; annual make, about 12,000 tons in rails.

Sixth,—The Mount Savage Iron Company, Maryland; annual make, about 5,000 tons in rails.

The principal cause of this separation in the two branches of the iron manufacture is due, probably, to the inadequacy of capital required to carry on the combined processes of smelting and puddling. The successful operations of the establishments enumerated and the present prosperity and prospects of the iron trade constitute great inducements for combining the two processes, which I am inclined to think will rapidly follow upon the accumulation of capital by those already embarked in the trade.

Rolling-mills, for plate and bar-iron, are met with throughout the States in which iron is produced.

In Massachusetts this branch of the trade is carried on to a considerable extent, the consumption being principally in the manufacture of cut nails. The chief seats of this industry are, Bridgewater, Wareham, Taunton, and Fall River; and the aggregate annual make cannot be less than 50,000 tons.

At Boston there are two rolling-mills upon a large scale. The East Boston works make bars, rods, &c., and the South Boston works confine their manufacture to rails. The management and details of the South Boston Mills were excellent, and the whole of the working arrangements were carried on in a manner fully equal to any that I have visited in this country. I ought to bear the same testimony also in regard to the arrangements of the rolling-mill at Fall River.

In New York State, Troy is the chief seat of the wrought-iron works, where upwards of 20,000 tons are annually consumed in the manufacture of bars, rails, spikes, and horse-shoes. The latter are made by an ingeniously contrived machine by which the heavy manual labour is entirely avoided, and a more regular make secured. Upwards of 2,000 tons of machine-made horse-shoes are turned out every year in the United States.

In New Jersey the largest works are at Trenton, belonging to the Trenton Iron Company. This may be looked upon as the leading establishment of the United States, not only in regard to its production, but also in regard to its working arrangements. About 20,000 tons of iron are consumed annually in the manufacture of rails, chairs, and wire; the latter forms an important portion of their trade. At Boonton, about 5,000 tons per annum are converted into cut nails; and at Bridgeton, another establishment turns out about the same quantity.

In Pennsylvania the establishments for the conversion of cast into wrought iron are numerous. In 1850 their number and description are thus given:—

	Number of works.	Number of fires.	Puddling furnaces.	Capacity.
Charcoal forges ..	121	402	436	50·250
Rolling mills	79	..	..	174·400*

The capacity being calculated at the rate of 125 tons per annum to each forge fire, and 400 tons per annum to each puddling furnace.

The charcoal forges are all upon a small scale, and their produce finds a ready sale, being much sought after for rolling boiler plate and other iron. At one of the country rolling mills which I visited I found them using charcoal blooms, for which they had paid at the rate of $40 per ton.* The blooms were first worked up in a puddling furnace and then tilted, after which they were again heated and rolled out into plates of the required dimensions. The cost of puddling and tilting was estimated at $10 per ton, and about the same amount was expended in the rolling process. The plates were selling for $80 per ton.

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* See Appendix G, H, O, P.

Charcoal boiler plate fetches a higher price, and is always guaranteed by the maker, as, owing sometimes to an imperfect process of reduction in the forge, a small portion of the fuel is left mixed up with the metal, and remains even after it has passed the puddling furnace and the tilt hammer. To detect the flaw in the iron when rolled out requires great care on the part of the foreman, who carefully notices, after it has left the rollers, whether the surface cools equally all over; if any black spots appear, they show that the plate is imperfect and contains cavities in which carbonaceous matter is usually found. The spots are then marked, and the plate laid aside. In the hands of the engineer they again undergo an examination; the practice of the boiler-makers being to rule them off in one-inch squares, and then test each square with the hammer, the expenses attending any unsoundness falling upon the maker.

Some of the rolling-mills are upon a considerable scale; those most worthy of notice are at Phœnixville, Safe Harbour, Danville, and Pittsburg. Bars, rods, and plate and sheet iron, form the principal part of the manufacture; rails are rolled at some eight or ten of the establishments; one or two roll angle irons of various sizes, and about thirty are engaged in the manufacture of cut nails.† This latter forms an important branch of the industry in this State, about 606 machines being employed in it. Each machine produces on an average 1,000 kegs of 100 lbs. each per annum, making in the aggregate 606,000 kegs, or 30,300 tons per year.

At Baltimore, and at Richmond, in Virginia, there are large establishments with a considerable production of wrought iron; and in the West, at Wheeling, Cincinnati, and St. Louis, several establishments on an important scale already exist, and appear likely to be considerably increased in order to meet the increasing requirements of the great Western markets.

A process, patented by James Renton in 1851, for making wrought iron direct from the ore, is being carried out upon a commercial scale at Cincinnati, in Ohio, and at Newark, in New Jersey. At the former place, where the works were idle for repairs and alterations, I had an opportunity of seeing the furnaces, &c., in process of construction, and at Newark I found them in full operation. At this latter place the working returns that were furnished to me were certainly very satisfactory. The operation, I believe, although several times attempted in this country, has never been successful.

The furnace was of a peculiar construction, resembling in shape an ordinary puddling furnace, at the extremity of which a chamber of the following dimensions,—10 feet high by 6 feet broad, and 7 inches wide,—was built up in fire bricks, forming, in fact, a kind of large verticle muffle or retort; this was entirely surrounded on the sides by the flue or chimney of the furnace. When in operation this muffle, or retort, is filled with a charge of ore and coal, both finely broken, and carefully mixed up together in the proportion of about 20 to 25 per cent. of coal to 75 to 80 per cent. of ore. The muffle in question held a charge of 12 cwt. The heated gases from the furnace playing round it raise the temperature of its contents sufficiently to induce combustion of the carbonaceous matter, which is carried on slowly at the expense of the oxygen of the ore. When the ore is sufficiently deoxydised, it is discharged from the bottom of the muffle as required into the "welding furnace," where the heat is considerably increased, and the iron is readily worked up into balls, and thence taken to the hammer in the usual way.

The iron by this process cannot be said to be puddled, as the ore never melts, but, having first been deoxidised in a close chamber, is simply welded together in what the patentee terms "an ore-welding furnace." He appears to consider that the great merit of the process lies in the use of the closed chamber, in which the iron is perfectly protected from the wasting effect of the flame and gases of the furnace during the process of reduction, which would otherwise, as they always do, oxidize and slag the ores;—the probable reason why all attempts have failed to work the ores in open chambers. The temperature at which the deoxidizing action is carried on is not high enough to cause the iron to combine either with the carbon of the fuel, or with any of the impurities, as silica, phosphorus, &c., which are always found in common cast iron.

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* The ton of *iron* is always the gross ton of 2240 lbs.;—except *blooms* and *puddled bars*, which are bought and sold by the "Ankony," or double gross ton of 2464 lbs.; and *nails*, which are sold by the net ton of 2000 lbs.

† See Appendix H, P.

The balls were drawn from the "welding furnace" for tilting every half-hour, their size depending upon the quality and yield of the ores that were being used. When I visited the works, a moderately rich hæmatite, yielding about 35 per cent. of metal was being used, and the balls weighed about 80 lbs. each. The average yield they obtained, I was informed, was 45 per cent., and the weight of their balls 100 lbs. The cost of a ton of blooms made at these works was given as follows:—

2½ tons of ore at $4	$10 00c.
1½ tons of coal for furnace	6 38
Coal for reduction chamber	1 25
Coal for engine	2 00
Welding and working	5 00
Tilting, $1 50 c.; labour, $3	4 50
	$29 63 c.

Without criticising these figures, which, perhaps, were given as referring to the most favourable conditions of the manufacture, and which, of course, will vary with different circumstances, I think that we must admit that Mr. Renton has done much in carrying into commercial operation a process which practically does make wrought iron directly from the ore. The operation was comparatively upon an insignificant scale it is true, and the quantity made certainly was but small; but if the principle is correct, both as regards produce and cost, the capacity of the furnaces could probably be increased, and, at all events, they could be multiplied to any extent. The principal obstacle appeared to me to exist in the difficulty of balling the iron in the welding furnace without getting some imperfectly decomposed ore mixed up with it, which necessitated extra labour with the hammer. Probably a little longer experience may suggest some mode of meeting this difficulty.*

So far as I could learn, this constituted the only novelty in the process of making iron in the United States. The successful result of Mr. Detmold's experiments in obtaining iron from the residuum (chiefly franklinite) of his zinc furnaces, can hardly, from their limited sphere, affect the great interests of the iron industry, though the ability and skill with which they were devised entitle him to merit as the inventor of a new process.

In the smelting furnaces (anthracite) the practice of economising fuel by the application of the waste gases to raise the temperature of the blast, and also to generate the steam power necessary for the works, is carried out to a far greater extent than with us, and certainly merits a passing acknowledgment.

A very important labour-saving machine too I noticed in general use in most of the rolling mills I had an opportunity of visiting, in the shape of a "*rotary squeezer*." This is fully as effective and much quicker in its operation than either the old hammer or the lever squeezer, termed the "alligator" in Wales; at the same time by its rotary action it saves the labour of turning the ball during the operation. The machine, though simple in construction, is necessarily made very heavy and strong to withstand the strain while at work. The accompanying *sketch* will show its more prominent points.

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* A great desire evidently exists in the States to manufacture wrought iron directly from the ores. Another establishment, of some magnitude, is now being erected at Motthaven, near New York, for carrying out a process of reduction (Harvey's patent) similar in principle to Renton's. In this the ore (magnetic oxide) is mixed with a certain proportion of charcoal—both in coarse powder—and then placed on inclined shelves or trays (steatite), in a suitable chamber immediately connected with a welding or balling furnace. A fire at the base of the chamber heats the mixture sufficiently to induce ignition, and the flame playing over the face of the trays, assists the reduction of the ore, which is then removed on to the welding-hearth and balled in the usual manner. Four furnaces are being erected, capable of turning out five tons per day each.—I. W.

Fig. 1.

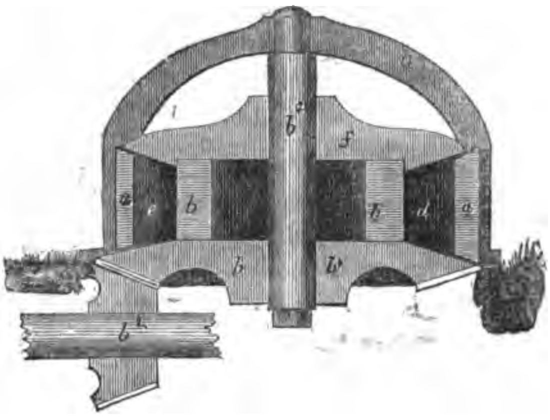

Fig. 2.

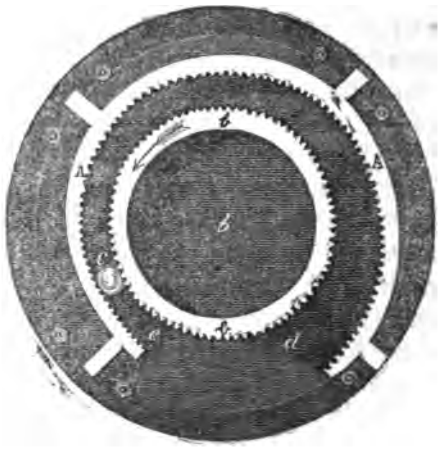

Fig. 1 gives a vertical section, and *Fig.* 2 an horizontal section of the machine.

a a a, represent a fixed circular case in cast iron, made very strong, and with ribbed or fluted sides, surrounding a stout vertical-ribbed roller, *b b*, which is fixed on to the shaft and pinion, b^2, b^2, by which it is driven at high velocities. The ball, *c*, is introduced into the "squeezer" at *d*, and being rapidly carried round under an increasing (eccentric) pressure, is delivered from the machine at *e*. The cap or top, *f*, is made to move vertically, so as by its weight to accomplish the upsetting of the blooms ere they pass round.

The invention is due to Mr. Burden, but has been subject to many close imitations which have quite recently occupied the courts of law in the State of New York. When the machine first appeared a doubt was raised as to its capability to squeeze the ball vertically, the rotary pressure being horizontal. Practically this is of little importance, as when the balls are drawn as nearly as possible the same size, the top which is moveable, and slides up and down, exerts a pressure sufficient for the purpose. At the Fall River Mills, I saw in operation a "rotary squeezer" (Winslow's patent), applying the same principle in a vertical instead of a horizontal direction. In this case a spring hammer was attached at the side which struck the ball at the end as it was passed through the squeezer.

The only other point of interest in connexion with this industry which I have to notice is the method of utilising the slags of iron furnaces which was illustrated by Dr. W. William Smith of Philadelphia in the New York Exhibition, in Class XXVII, where a collection of bottles, slabs, bricks, and other articles, run direct from the reducing furnace, were exhibited. The finish and appearance of the various articles would justify the expectation that the process, if applicable to the slags of coal furnaces generally, would be of great industrial importance. The price was about 4 c. per cubic foot for slabs.

At present the United States is mainly dependant upon this country for its supply of steel. This circumstance is due entirely to the infancy and the undeveloped condition of its iron industry, inasmuch as the American iron is in itself well adapted for conversion into steel, while in this country we are obliged to import our supply of steel iron from the north of Europe. The consumption of steel in the States has increased largely in the last ten years, and with the returning prosperity of the iron interests we find the establishments for the manufacture of steel increasing likewise. In 1840, the Treasury returns gave the importation of foreign steel at 44,506 cwt., and in 1850, at 127,517 cwt.

The manufacture of steel is principally carried on in Pennsylvania; Philadelphia being the seat of the manufacture in the east, and Pittsburg in the west. At Philadelphia there are eight establishments in operation, making annually from 3,000, to 3,500 tons; at Pittsburg there are eleven converting furnaces of an average capacity of 25 tons, of these nine are used for converting steel for common blister coach springs and plough steel, and two are used for the purpose of manufacturing cast-steel, only one establishment of which exists at Pittsburg, working 19 melting-pots, and producing about 500 tons per annum. At Wheeling, Virginia, a single furnace is worked, which has about the same capacity as those at Pittsburg. The produce finds a ready market at the following prices:—

	per lb.		
Warranted cast steel	12½	to	15 cents.
Extra ditto	15	„	25
Machinery ditto	10	„	12½
Plough slab ditto	8½	„	9
Double shear steal	..		..
Single ditto	..		..
German ditto	7	„	10
Sykes' blister ditto	..		14
Common ditto	4½		
Coach-spring ditto	5¼	„	8
Saw steel	9	„	16
Shovel steel	9	„	12½

All sizes under ⅝ths, and above 2 inches square, are charged extra.

In the State of New Jersey, at Jersey city, the Adirondac steel works have resumed operations, and are now in full progress. Specimens of the manufacture of this Company were exhibited in 1851, and received the award of a prize medal from the jury of Class I. The Adirondac iron contains small proportions of titanium and manganese, and is found to be particularly suited for the manufacture of steel. About one-third to two-thirds of this iron is used mixed with the remaining proportions of New Jersey anthracite iron. These works were producing when I visited them at the rate of about 500 tons per annum, and preparations were in progress for increasing the number of their melting-pots. The manufacture has an immediate sale at prices varying from 10 to 15 cents per pound, according to quality, &c.

From the foregoing statements it appears that the production of iron and steel in the United States falls short of the consumption, and that in order to supply the demand, the produce of other countries has to be imported to a very large extent. In regard to the latter article, no cause exists why the home manufacture should not be increased until it is equal to the entire supply. The American iron is well suited for conversion into steel, and the capital required for carrying out the process is not so large as that required in other branches of the iron industry.

In the general manufacture of iron, however, the case is different; the demand has increased in a ratio far beyond the ratio of production. The consumption of cast and wrought iron in the United States at the two periods, 1840 and 1850, is thus given:—

	1840.	1850.
	Tons.	Tons.
Make of cast iron	286,903	564,755
Cast iron imported	5,515	74,874
Wrought ditto ditto	75,351	366,640
	367,769	1,006,269

Thus while the home production only doubled itself in the period of ten years, the increase in the quantity imported to meet the consumption was nearly sixfold during the same period.

At the present time circumstances are particularly favourable for developing the home production of the States, and we find that it has made a gigantic stride in the past year, rising from about 500,000 to 800,000 tons. This has been occasioned chiefly by the great rise in the price of iron in the English markets, for they virtually rule the markets in the Atlantic States of America. As long as the price of English iron prevents its importation into the Union under \$20 per ton for pigs, and English bar-iron under \$50 per ton, the home manufacture can compete profitably with it in the markets, and the iron industry of the States will continue to flourish. Any fall of price in the

English iron that would bring down the price in the American markets lower than the sum quoted, would immediately check their home production, and again throw them upon our markets for their supplies. The difference in price between the two markets, inclusive of all charges for freight, commission, insurance, duties, &c., may be taken at 80 per cent.; thus in round numbers pig iron selling at Liverpool at 45*s.* to 50*s.*, would cost $20 at New York.

In a recent Report from the Secretary of the Treasury, which was referred to the Committee on Finance, the average annual price of iron in the English and American markets respectively for the ten years ending 1853, is given as follows:

	$	c.
Average of merchants' bar iron at Liverpool	31	78
„ „ at New York	56	52½
„ „ at Pittsburg	55	45½
Ditto of best refined iron at Liverpool	47	64½
„ „ at New York	74	50
Ditto of railroad iron in Wales	34	51
„ „ in New York	42	20
Ditto of pig-iron in Glasgow	13	21
„ „ in New York	26	76
„ „ in Pittsburg	26	57

The production of iron for the past year 1853-4, exceeds that of any former year, and appears to approximate pretty closely upon the total capacity of the furnaces at present in blast. The stimulus the trade has received from the increasing demand for its produce has already produced some disturbance in the supply of labour, and caused a rise of from 20 to 25 per cent. in its market value. How far labour could be obtained in force sufficient to sustain in the various operations connected with iron making, as mining, quarrying, furnace work, &c., an increase in production in a ratio equal to the increase in consumption, remains to be tried. If it could be done at all, it could only be effected, I think, by the payment of a much higher rate of remuneration than that at present paid.

In these operations very little skilled labour is needed, while the muscular labour of the immigrant finds an equally remunerative, and at the same time a more congenial employment in developing the surface riches of the mighty West. Thitherward the great mass of immigrant labour moves, and this is only likely to be diverted from its course by the temptation of such a rate of wages as will materially increase the cost of their produce. At the present time a very small number of the men employed in the iron works are native Americans, the great proportion is either Irish or German; indeed these two countries appear to furnish throughout the States, the subordinate labour in all the various branches of Industry.

LEAD.—(CLASS I.)

Notwithstanding the existence of lead ores has been identified in nearly every State in the Union, and mining operations have been carried out in most to a greater or lesser extent, it appears that up to the present time the States are dependent upon the lead-producing countries of Europe for the largest portion of their supply. This arises probably from two causes: 1st, the greater inducements offered to labour in the development of those more important branches of productive industry, the cultivation of the surface, as well as the operations connected with the mining of coals and iron; and, 2nd, the absence of that experience so necessary to guide and direct the operations, and the general insufficiency of capital to carry out effectively those mechanical arrangements upon which success in mining so frequently depends.

In respect to this particular mineral, so far as I could learn, the mining operations are confined everywhere to mere surface-working, save at Phœnixville, in Pennsylvania, and at one small mine at Arkansas. At Phœnixville, the mines under the able direction of Mr. C. M. Wheatley are carried on perfectly upon the Cornish system, Mr. Wheatley having availed himself to the fullest extent, not only of the experience of our mining practices, but also of the practical skill of our men. The captains, as well as most of the miners, are from Cornwall; and in the office of the works, in which I was pleased to see well-arranged cabinets containing duplicate specimens of the beautiful ores he exhibited in Class I, I recognised a draughtsman and surveyor whose work was well known in the mapping-room of the Museum of Practical Geology in Jermyn-street.

These mines are situate in Chester county, near where the Pickering creek joins the Schuylkill river. According to Professor H. D. Roger's Report, these veins belong to a group of lead and copper-bearing lodes of a very interesting character, forming a metalliferous zone which ranges in a general east and west direction across the Schuylkill river, near the lower stretches of the Perkiomen and Pickering creeks, in Montgomery and Chester counties, and bids fair to constitute, at no very distant day, a productive and important mineral region.

The individual veins of this rather numerous group are remarkable throughout for their general mutual parallelism. The workings commenced only three years ago upon the Wheatley vein; now there are two others in successful operation—the Charleston, which runs parallel to it, at a distance of about half a mile westward; and the Brookdale, which appears to be merely an extension of the Wheatly lode. It lies almost in a direct line with it, not deviating, in fact, the amount of half a degree in the entire distance between them, which is but little short of a mile. This view is also confirmed by the correspondence in the dip of the two veins, and also by the close agreement, amounting almost to identity, between the vein-stones and ores of the respective lodes. Mr. Wheatley, the managing partner, was good enough to accompany me in my visit to the mines, and to point out to me the many difficulties he had to overcome before he had arrived at the present successful state of the operations. So convinced was he of the advantage of following the vein below the level commanded by his present engine-power, that he was about to erect a 300 horse-power pumping-engine midway between the Brookdale and Wheatley shafts, so as effectually to relieve the mine from any influx of water that might find its way into the lower levels. He also took me to see a copper mine which he was just commencing operations upon, and which certainly, as far as surface indications can be relied on, appeared likely to sustain the character he has acquired by his successful direction of the Wheatley lead-mines.

The ores of these mines, as well as most of the lead-ores throughout the States, contain silver in varying proportions. At present, no process of separating the two metals has been attempted, owing to an idea that it was only profitable when the ores were very rich in silver. I am inclined to think, however, that a commencement will shortly be made to desilverize the lead by Pattinson's process, which could be advantageously applied to the greater part of these ores, and the practical mode of working, which I had an opportunity of making known to several gentlemen connected with this industry.

The annual amount of the lead-produce of the States may be taken at from 18,000 to 20,000 tons, which is supplied by the following States: Illinois, Wisconsin, Missouri, Arkansas, Virginia, Pennsylvania, and New York, in about the following proportions:—

From Galena and the Upper Mississippi, which would include the produce of the two first-named States, the quantity sent to market was, in

1841	452,814	pigs of 32 to the ton of 2240 lbs.	
1842	447,859	.. ..	
1843	561,321	.. ..	
1844	624,601	.. ..	
1845	778,460	.. ..	
1846	733,264	.. ..	
1847	771,679	.. ..	
1848	675,902	.. ..	
1849	625,914	.. ..	
1850	568.807	.. ..	
1851	472,630	.. ..	
1852	381,161	.. ..	
1853	The first six months shows an increase of 17.319 upon March, April, May, June, July, August		315,984
	Corresponding months last year		298.665
			17,319

The mode of occurrence of the lead-lodes in the Galena district is so remarkable that I thought it desirable to visit the mines, but on arriving at Chicago I found that the railway communication extended no further than Rockford, leaving nearly 100 miles to be performed by coach, which the time at my disposal would not permit.

Professor Hall, of Albany, who is well acquainted with the district, describes them as occurring in the silurian limestone, to which he gives a thickness of 50 to 80 feet. This rock, which is of a porous character, is traversed by fissures having a generally north-east and south-west direction, while others cross these at nearly a right angle. The galena is found in these fissures in somewhat variable quantities, those having the most nearly north and south directions proving generally to be the richest lodes. The ore occurs with calcareous spar, and mixed with or surrounded by clay in the fissures, and is rarely, if ever found, either attached to the wall-rock or penetrating it. The limestone below the proper lead-bearing rock is a thin-bedded mass, with continuous open fissures. In following the lead-bearing fissures downwards, they are found not to penetrate the rock below, and the vein either thins out abruptly or spreads horizontally between the laminæ of the subjacent rock. In some places the metalliferous rock may be traced underlying strata of a thin-bedded argillaceous character, with shaley partings, and nearly free from joints. This rock is designated the "cap-rock" by the miners, and the lead-ore is said always to terminate abruptly when it reaches this point. The mines which have been worked are chiefly in the exposed surface of the metalliferous rock, and have never been carried to any extent beneath where it is covered with the "cap-rock."

A few years ago the mines of the Lower Mississippi, Missouri, and Arkansas, gave a larger yield, now they return only from 1,000 to 2,000 tons per year, with a decreasing ratio of production. All from the upper and lower mines is melted on the spot. The great decrease in the lead-produce of these two districts may be traced principally to the following causes: 1st. Previous to 1846 these mineral districts were in the hands of the United States Government, who permitted, and indeed encouraged, people to go "prospecting," as it is called, for minerals, and then let them the lands under very favourable conditions; and every year new enterprises started, and fresh mines were opened. At that time the lands were sold to private individuals, who, of course, purchased with them their rights to minerals, and refused to recognise the system of individual enterprise, which had before been encouraged by the Executive. Hence a gradual falling off is seen in the returns from these districts. 2nd. The greater inducements offered by the newly-discovered riches of California, where the value of the ores and the mode of working them were more in accordance with the habits of the miners. 3rd. The failures in working for ore below the water-level in small veins, and want of sufficient power to drain them effectually and economically, and also of a more correct knowledge of the geology of the lead-bearing strata. Although such decrease is shown in the production, the price of lead has been steadily increasing. In 1847, on the levee at Galena, the rate was $3 60c., while, during 1852, the article readily commanded $4 10c. per pig.

From Virginia the supply is on the increase, in 1851-52 it was about 800 tons; in 1852-53 it amounted to upwards of 1,200 tons.

From Pennsylvania the present annual supply may be taken at 1,500 tons, and with an annual increase; and from the Ulster County Mine, in New York State, about the same amount is obtained.

The following statement gives the quantity of lead imported into the United States from foreign countries for the three years ending May 1, 1853:—

	From April 1850-1.	From April 1851-2.	From April 1852-3.
	Tons.	Tons.	Tons.
From England	7,576	5,882	6,077
„ France*	4,623	4,209	5,749
„ Spain...	6,631	6,146	6,563
„ Germany	1,057	1,332	2,391
„ Trieste	133	..	..
„ Palermo	12	..	..
„ Smyrna	18	..	..
	20,050	17,569	20,780

In the industrial applications of lead, the only new process which I met with was in the manufacture of shot. This was carried out in the following manner. The building, of the height of an ordinary house, was arranged so that a cylinder or large shaft in iron or wood should connect the upper story where the melting-furnace and dropping-pan were fixed, with the lower story in which the water receiving-tub was placed. This cylinder or pipe constituted the air-shaft, and communicated at the bottom with a blower driven by steam power. When in operation the metal was melted at the top in the usual way, and dropping down this shaft encountered a powerful blast of cold air being driven up it, the divided metal or shot finally falling into the water-receiver at the base. The advantages of this over the ordinary method of making shot, show themselves in two or three points. In the first place, the expense of building a high tower is avoided, the effect obtained by letting the molten lead fall through a long column of air in a quiescent state, is equally secured by its descent through a shorter column driven rapidly in an opposing direction. The saving in the power required to lift the lead to the lesser height will go far towards furnishing the power required to drive the blast. In the practical part, I was informed a very decided advantage was shown over the ordinary method. In dropping lead from a high tower, it is necessary to keep the lead at as low a temperature as possible, consistent with its fluidity or capability of being poured, in order to counteract the tendency which the shot [the divided metal] has to burst, while falling at a high velocity, owing to the unequal resistance of the air, and thus become useless except as metal.

In the old method a considerable proportion of waste shot is thus incurred, and in dropping large sizes, a greater or less proportion of smaller sizes are always made, and indeed, a certain quantity falls of so small a size, as to be fit only to be melted up again. By this new method, the metal is dropped at a higher temperature, its fluidity enables it to drop more rapidly, and the falling shot are cooled so rapidly and so equally by the blast, that no loss is sustained by bursting, and each dropping made varies but in a small proportion from the sizes worked for.

The process was invented in 1848 by David Smith, of the firm of T. O. Leroy & Co., of New York, who commenced the manufacture of shot in 1849, and have carried it on successfully up to the present time, having made and sold upwards of 5,000 tons in that period. The process is patented in the United States, and also in this country.

At the works of Messrs. Tatham at New York and at Philadelphia, lead pipes of various sizes are made by hydraulic pressure on a very extensive scale.

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* Most of the lead entered from France is actually the produce of Spain, having been taken from that country to France for the purpose of having the silver extracted from it.

COPPER.—(CLASS I.)

The copper industry of the United States is in a more advanced state than the lead, although at present the requirements of the country are supplied from other sources in a greater proportion than from their own. Copper ores, however, are met with in most of the States which are traversed by the great mountain ranges of the first and second chain, and in the north-west of the State of Michigan along the shore lines of Lake Superior, the large deposits of metallic copper are met with, which have afforded such a field for speculation and discussion to the mineralogist as well as to the geologist.

The quantity of copper consumed annually in the United States may be taken at between 8,000 and 9,000 tons, of which about 1,800 tons are the produce of the different States of the Union. Of this quantity about five-sixths are obtained from the Lake Superior district, and the remaining one-sixth from the various copper-producing States, from which ores were exhibited in Class I.

The States which afford most promise of large copper returns are,—Missouri, Tennessee, Maryland, North Carolina, Pennsylvania, and Connecticut. The information I was able to obtain in reference to their present condition and yield, may be briefly given as follows:—

Missouri, yield uncertain, works nowhere far advanced, probably many of the old ones abandoned; in the Marramac district, a small yield and mixed with iron pyrites.

Tennessee mines, not worked to any extent, very uncertain at present.

Maryland, Dollyhide mine, reported on very favourably by Dr. Jackson; amount of ore raised small.

North Carolina, favourable reports upon recently opened mines, fine samples have been sent to market.

Pennsylvania, new mines opened in West Pennsylvania; no returns but good prospects, the same in Chester county, East Pennsylvania.

Connecticut, ores good and rich.

The yield of the Lake Superior district is about 1,500 tons per annum, produced by the following mines in the proportions given:—

	Tons.			
Cliff Mine, gross yield ..	1,000	averaging	60	per cent. of metal.
Minnesota „ ..	600	„	70	„
North-west „ ..	100	„	76	„
North-western „ ..	40	„	50	„
North American ..	200	„	65	„
Copper Falls „ ..	50	„	60	„
National „ ..	50	„	60	„
Various other small mines, say „ ..	200	,,	55	„

The copper imported into the United States from foreign countries comes in, both in the shape of ores and in a manufactured state, as bars, ingots, cakes, &c.

Of the former, about 7,000 tons were imported during the past year, [1852-3], giving an average yield of 30 per cent., or about 2,000 tons of metal; and the quantity of the latter for the same period is given at 4,800 tons. Of this amount, about 3,000 to 3,500 tons are supplied by this country; but as the sheet copper which forms a large portion of the trade is admitted free of duty, the Custom House returns may not be very accurate. The remaining portion is obtained from South America.

Thus the sources and yield of the copper supply to the United States are—

	Tons.
From the reduction of native ores	300
From the native copper deposits of Lake Superior district ..	1,500
From the reduction of foreign ores	2,000
Imported as metal	4,800
Total	8,600

Of this quantity, about 7,000 tons are consumed by the rolling mills, and distributed over the different markets of the Union; the remaining 1,600 tons being disposed of in the manufacture of sheet brass, kettles, wire, buttons, &c., and articles usually made in a brass mill.

There are already 6 copper works containing 7 rolling mills and 3 smelting furnaces in the States, which are located as follows:

Baltimore	1 Rolling.
„	1 Smelting.
New York	2 Rolling.
New Haven	1 Rolling.
„	1 Smelting.
Taunton, Massachusetts	2 Rolling.
Boston	1 Rolling.
„	1 Smelting.
Pittsburg	1 Rolling.

A portion of the copper used is converted into yellow metal for sheathing, of which about 1,500 tons are turned out by these mills annually.

These estimates have reference to the past year, 1852-3; both the quantities of ores, and the sources whence they are obtained, must of course be subject to variation from year to year. It is, however, quite evident that extensive and rich deposits of copper ores exist in various parts of the Union, and that they are susceptible of developement to an extent probably equal to the requirements of the country, by the judicious application of capital, combined with a better acquaintance with the mining practices of other countries.

ZINC.—(CLASS I.)

Zinc is a metal more sparingly distributed on the surface of the globe than most of the other metals in ordinary use. In Europe our wants are chiefly supplied from the deposits of zinc ores in Belgium and in Russian Poland and Silesia, and the United States market is still largely supplied from the same sources, though recent researches have certified the existence of an enormous deposit in one of her Atlantic States. At the Exhibition of 1851, in the United States department, a fine specimen of this ore was exhibited in the shape of a mass weighing upwards of 16,000 lbs., and accompanied by some of its products. It excited considerable attention on the part of our own, as well as of foreign mineralogists, both on account of the remarkable fineness of the specimen, and of a peculiar mineral "franklinite" with which it was associated. The articles were sent over by the New Jersey Mining and Exploring Company, which, however, were not then very successful in their manufacturing operations. Since that period the company has been re-organized, and under the judicious management of Mr. C. E. Detmold, a gentleman whose scientific acquirements, combined with his well-known skill as an engineer, admirably qualify him for the post, the exploitation has been resumed, extensive works erected at Newark, and an industry firmly and successfully established that bids fair, in the course of a few years, not only to meet the requirements of the home market, but also to furnish a supply to other non-producing countries. I had an opportunity of visiting the mines at an early part of the summer, and at a later period Mr. Detmold was good enough to accompany me through the manufacturing establishment at Newark, New Jersey.

The ore, which is the *red oxide*, is worked in Sussex county, in the State of New Jersey, about 50 miles from New York, and is found in a regular vein of 9 feet thick, lying immediately upon a 12 feet thick vein of franklinite in small crystals embedded in a paste of the red oxide, the proportions of each being nearly equal. The vein has a regular dip of 80°, and rests immediately on the gneiss, the surface being composed of a bed, more or less thick, of a highly crystalline metamorphic limestone. The mining operations are comparatively inexpensive; the ore, lying at a high level, is worked at about $2 per ton; the transport, partly by road and partly by water, to Newark, costs $4 50c. per ton—in all, $6 50c., delivered at the works. There the manufacture commences, which at present is confined to one article, the white oxide, so extensively used as a substitute for white lead. Although large quantities of metallic zinc are imported by the States, no attempt has yet been made at the reduction of the ores for that purpose. The ore containing the small crystals of franklinite, when reduced to powder and mixed with oil, forms a deep brown coloured paint, for which a considerable demand has latterly sprung up, as it has been found to be an economical and excellent application to iron surfaces. This quite recently has been the means of bringing it into notice.

The manufacture of the white oxide from the red oxide* is very simple, and is effected in the following manner:—The ore is first broken down by stampers, and then passing through two sets of iron rollers, is crushed to about the fineness of coarse sand. In this state it is mixed up with about one-third of its weight of fine coal† (screenings), and is then ready for the furnace. The furnaces are constructed after the shape of a long muffle, having a grate at one end, upon which an anthracite fire is sustained, and at the opposite end an aperture with an iron door, which is kept closed save when the furnace is being charged, or the charges being stirred by the workmen. About 800 lbs. to 900 lbs. constitute a charge, and it requires about eight hours to work off this quantity, so that each furnace works on an average 3 charges every 24 hours, and is kept going night and day, Sundays included. The fire-doors and ash-pit are kept closed, and a large volume of air is supplied by means of an ordinary fanblast, blown into the ash-pit under the fire-bars. A small portion of the flame passes through the muffle where the charge (ore and coal) lies, the remainder is carried through the flues, which occupy as much as possible of the exterior of the muffle,—the whole being constructed in fire-brick. The furnace is kept at a bright red cherry heat. After having been charged about two hours, the charge begins to give off vapours of oxide of zinc, which increase gradually for 4 or 5 hours, during which time the workmen stir the mixture occasionally with long iron rakes. In about eight hours, or sooner if the ore has been crushed very fine, the zinc vapours cease, and the charge is then raked out, and the furnace re-charged with the mixed ore, which has meanwhile been heated on the top of the furnace arch. The furnaces are arranged in "banks" of twelve in a row. The muffles communicate by means of vertical cast iron pipes, 18 inches in diameter, with a large horizontal pipe or main 3 ft. in diameter. At the point of junction between these vertical pipes and the muffles, an aperture is left, through which a supply of heated air is passed for the purpose of more thoroughly oxidizing the zinc vapour as it leaves the muffle.

At the extremity of the horizontal main a powerful fan-blower is driven with high velocity; this has a double action, drawing the vapour from the furnaces and driving it along the pipe into another portion of the building, called the "catching-house," in which enormous bags made of cotton canvas are suspended horizontally in rows, having a large number of bags of smaller diameter attached to them in a vertical manner with open ends reaching to the floor. The large bags are about 5 feet in diameter and 150 feet in length; the smaller ones are from 18 to 24 inches in diameter. By passing along the pipe which is made in thick boiler plate, the oxide and accompanying gases are sufficiently cooled down to prevent their firing the cotton bags, through the meshes of which the gases speedily escape, the oxide remaining behind. The bags are shaken every two hours, when the oxide, which has been collected in them and adhered to their sides, falls down to the bottom, and is then removed into other bags, and carried to the storing bins.

It is either sold in a dry state in barrels, holding 200 lbs. each, or ground up with linseed oil as a paint, and sent to market in kegs of various sizes. The oxide of zinc, though perfectly white in a dry state, possesses frequently a greenish tint when mixed with oil and exposed to the action of the light. This probably is due to the oxidation having been imperfect, a small proportion of sub-oxide (?) being sufficient to give it the objectionable tint. Mr. Detmold informed me that he expected to remedy the effect by submitting the oxide to a gentle red heat in ovens which he was erecting for the purpose, and then passing a current of air through, so as more thoroughly to oxidize it. By this

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* The red oxyde is the common oxide of zinc (Zn. O), combined with small proportions of manganese and peroxide of iron, from which its red colour is derived. The "franklinite," is composed of the same metals, combined in larger and definite proportions,

Zinc ..	.. 17	
Iron ..	.. 66	
Manganese	.. 16	(Berthier.)

† The Rhode Island coal was being used at these works.

process he had been able to produce it of the finest white colour. The present capacity of the works is equal to about 50 tons per week, with a ready market for it for home consumption.

The residuum, consisting chiefly of oxide of iron, manganese, and zinc, resulting from the partially decomposed franklinite, has been experimented upon very successfully by Mr. Detmold. Iron of the finest quality has been produced from it, very much resembling in its character the "spiegel-eisen" of Germany. The fracture has large and brilliant lamellar facets, sometimes very beautifully crystallized, and so hard as to cut glass readily. Like the German iron, which is produced from the spathic ores of Siegen, Sayn-Altenkirchen, Mussen, &c., it contains fully 5 per cent. of carbon, and nearly the same proportion of manganese, and is easily converted into iron or steel of superior quality.

This method of utilizing the residuum is also adapted for the reduction of the franklinite ores, hitherto in themselves of but little value, and will render the secondary products almost of equal value to the staple manufacture. The results of the experiments must be no less gratifying to Mr. Detmold than beneficial to the interests of the company of which he is the President.

Gold.—(Class I.)

The transmissions of gold from the new State of California have caused a corresponding increase in the gold currency of the States, and have invested the Mint operations with more general interest than under the previous ordinary circumstances they possessed. The same condition of things exists in this country; and as it is intended to establish a mint in the gold-producing colony of Australia, I thought it desirable to obtain as much information as I could in reference to the organization and working details of those in the United States.

The head establishment is at Philadelphia, and is called "The Mint"; there are also three "Branch Mints;"—at New Orleans, in Louisiana; at Charlotte, in North Carolina; and at Dahlonega, in Georgia, respectively. The Branch Mint in California, and the Assay Office in New York, are not yet completely organized.

At the Mint in Philadelphia, gold, silver, and copper, are coined; at New Orleans, gold and silver are coined; while the branches at Charlotte and Dahlonega coin gold only. At "The Mint," the executive staff consists of a director, treasurer, chief coiner, melter and refiner, engraver, assayer, and assistant-assayer. At the New Orleans Branch Mint the staff consists of a superintendent, treasurer, melter and refiner, and coiner; and at each of the other two branch mints there are but three officers,—superintendent and treasurer (combined), assayer, and coiner. The several duties of these officers, the remuneration they shall receive for their services, and the amount of security they shall give for the due performance of them are duly prescribed by an Act of Congress supplementary to the Act entitled "An Act establishing a Mint and regulating the Coins in the United States;" this latter Act giving all the details referring directly to the coinage of the country.

At the United States Mint at Philadelphia, the salaries are fixed as follows:—Director, $3,500; treasurer, $2,000; chief coiner, $2,000; melter and refiner, $2,000; engraver, $2,000; assayer, $2,000. At the New Orleans Branch Mint the salaries are, to the superintendent, $2,500, and $2,000 each to the other officers; and at the other branch mints the superintendents receive $2,000, and the other officers $1,500 respectively. In each of the establishments the appointment of assistants, subordinate officers and servants, is left entirely in the hands of the chief of the different departments.

In visiting the Mint at Philadelphia I had the advantage of being taken through the several departments by the chief coiner, Mr. Franklin Peale, and the melter and refiner, Professer J. C. Booth, who kindly furnished me with the following details of their operations. As the gold is brought to the Mint in various quantities and in a crude state, it passes necessarily through the department of the refiner before it reaches that of the chief coiner; I therefore give the actual details of the refining operations upon sundry deposits of gold, amounting in the aggregate to $2,000,000.

The deposits are immediately weighed and a certificate of their gross weight issued. The fires having been lighted in the five furnaces of the deposit melting-room at four or five o'clock, A.M., all the deposits, amounting perhaps to seventy or eighty, are melted before noon; assay slips are then taken off and the assays finished* the next morning, after which their values are calculated by the weight after melting, care being taken to include all the grains that can be procured from the flux, pots, &c., by grinding them up under a pair of small chasers, sifting, and washing. There is a clerk and his assistant and one hand wholly engaged in performing all the weighings for the treasurer, such as weighing deposits before and after melting, ingots for coinage, fine bars, and the clippings after cutting out the planchets. There are five men in the deposit melting-room, two of whom attend to two furnaces each at the same time, one to one furnace and washing grains, and the remaining two are labouring assistants. The whole deposit of $2,000,000 is melted in three or four days in the deposit-room and assayed by from the third to the seventh day.

As soon as the first deposits are assayed, say on the third day (if expedition is necessary), or always on the fourth, they are granulated in the proportion of one part of gold to two parts of silver. The pots contain 50 lbs. of gold and 100 lbs. of silver, equal to 1,800 oz., and each melt requires about an hour. With four furnaces (attended by four melters and two aids), there are ordinarily made thirty-two melts per day, but when hurried forty-eight melts can be made, making from one-third of a million to one-half of a million dollars per day. Two days' work, or about $650,000 worth of gold, equal in weight to one ton (avoirdupois weight), are granulated for a single setting with acid. The granulated metal is charged into large pots, together with pure nitric acid of 39° Beaumé, between the hours of seven and nine A.M. on the sixth day, and steamed for five hours. The pots, made in Germany, are two feet in diameter by two feet in depth, and set in plain wooden vats, lined with $\frac{3}{16}''$ sheet-lead; a single coil of copper pipe passing around the bottom of the vat blows the steam directly into the water in which the pots are set to about half their depth.

The vats are arranged in a small house in the middle of the room with a large flue connecting with the chimney-stack, so that when in action the odour of nitrous fumes is scarcely perceptible in the building. The $2,000,000 require about sixty such pots; they are stirred about once each hour, say altogether five times, with simple wooden paddles; the next day (seventh), the acid solution of nitrate of silver is drawn off by a gold-syphon into wooden buckets, and transferred to the large vat, in which it is precipitated by salt (chloride of sodium), and fresh acid added to the metals, now containing very little silver. Steaming for five hours on the seventh day completes the refining of $650,000. Early on the eighth one pot is drawn off, washed with a little warm water, and the gold-powder transferred to a filter. Fresh granulations are then put into this empty pot, and the acid of the adjoining pot baled over upon them, and thus through the series, the whole being re-charged in from two to two and a-half hours. After steaming for five hours, the acid which contained but little silver from the preceding day becomes a nearly saturated solution of nitrate of silver. By this arrangement 4½ lbs. of nitric acid are consumed altogether for each pound of gold refined, and the latter is brought up to 990 at 993 m. fine,—rarely below 990. Thus every two days 13,000 lbs. of nitric acid are used. In the course of last year 1,000,000 lbs. of pure nitric acid, at seven cents per pound, equal to $70,000, were consumed.

The gold is washed with hot water on the filter during the eighth day, and until it is sweet (say by 7 P.M.) The filter consists of two layers of tolerably stout, coarse muslin, with thick paper between, in a tub with a false bottom, 2½ feet in diameter and 2½ feet deep, and mounted on wheels. One of the men remain, after washing hours, until 7 P.M., when the watchman of the parting-room continues washing the gold and silver until sweet, *i.e.*, until the wash-water ceases to color blue litmus paper. Early on the ninth day the wet gold is pressed with a powerful hydraulic press, and the cakes then thoroughly dried on an iron pan, at a low red heat. This process saves wastage in the melting-pot, since there is no water remaining in the pressed metal to carry off gold in its steam. The same day (ninth) the gold is usually melted with a less proportion of copper than is requisite to make standard metal, and cast into bars, which are assayed by noon on the tenth. They are then melted with the proper quantity of copper, partly on the same day, partly early on the eleventh, and assayed and delivered to the coiner the same day. On the fourteenth they are ready for delivery to the Treasurer as coins.

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* The mode of assaying is according to the "wet process" of Gay Lussac. This is too well known to need description here.

The silver solution drawn off from the pots is precipitated in a large wooden vat of 10 feet diameter by 5 feet deep, and the chloride of silver immediately run out into large filters [6 x 3 x 14] where it is washed sweet. The filter is covered with coarse muslin, and the first turbid water thrown back; the filter, which is on wheels, is then run over to the reducing vats, and the chloride shovelled into them. There are 4 such vats [7 x 4 x 2] made of wood and lined with lead, 1 inch thick in the bottom. A large excess of granulated zinc is thrown on the moist chloride in the vats, without the addition of acid; the reduction is very violent, and, when it slackens, oil of vitriol is added to remove the excess of zinc. The whole reduction occupies a few hours, and after a night's repose the solution of mixed sulphate and chloride of zinc is run off into the sewer.

About 2 tons of zinc per $1,000,000 of gold are employed; the silver, however, in this amount, say 10 per cent. by weight, should only take, by equivalents, about 2,400lbs., so that nearly 2 equivalents of zinc for 1 equivalent of silver are used. This is found to be advantageous, as both time and space are greatly economised by this excess.

The day after the reduction the reduced silver is washed, and the second day it is pressed and dried by heat, the same hydraulic press as for gold being used, but with different drying-pans. The same silver is used again for making fresh granulations, but as it accumulates from the Californian gold, 10,000 or 20,000 ounces are now and then made into coin, great care being taken in this case to avoid getting gold in it when drawing off the silver solution, and in the press.

Such are the actual working details in refining a specified amount, ($2,000,000) of gold, the first-third of which is delivered as coin in 14 days after its arrival, and the third-third in 18 days.

But as there is a bullion-fund of $5,500,000 allowed by Government, depositors are paid from the third to the fifth day after an arrival, *i.e.*, as soon as the gold is melted, assayed, and its value calculated. When two heavy arrivals occur in close succession, the time of refining and coining can be shortened from 14 to 10 days.

The number of men engaged in the refining department is 14: 1 foreman, 8 for the parting process, 3 for reducing, and 2 for pressing and drying. In the gold melting-room there are 3 melters and 2 assistants. The total number of hands in the melting and refining departments is 34, including a melting and parting foreman, and 3 in the place for grinding, sifting, washing, and sweeping. This last place or sweep embraces all pots, ashes of fires, trimmings of furnaces, ashes of all wood-work, &c., &c.

The late law for reducing the weight of silver coin necessitated an increase of force, and 15 more were in consequence employed for this purpose. While $50,000,000 in a year have been parted with the above force, they could with the same force and apparatus refine $80,000,000 if it were required.

After many experiments upon anthracite, Professor Booth stated that he had at length fully succeeded in employing it for melting both gold and silver in the same furnaces, slightly modified, in which he had been accustomed to melt with charcoal. This change had been accompanied by great economy in the cost of material and labour, and by greater comfort to the workmen, from their being less exposed to heat. The cost of charcoal (of the best quality—hard pine-knot coal) is 16 cents per bushel, delivered at the Mint; and while the cost of this fuel for all their operations in 1852, when gold was chiefly refined and melted, was about $7,000, the cost of anthracite will be from $600 to $1,000. In using the anthracite he found that a simple draft of air, without a blast, was quite sufficient to sustain combustion.

Californian gold frequently contains the alloy "iridosmine," which is no always detected by the assay. In order to remove it as far as possible without actually dissolving gold, it is allowed to subside first in the granulating crucibles, and then in the crucibles for toughening (melting fine gold and copper). If the assayers report its presence in the toughened bars, they are again melted, and the iridosmine allowed to subside. By these three, and often four successive meltings, the gold is separated from its troublesome companion as far as practicable. The gold thus refined, and reduced to the proper standard [*Section* 8: "And be it further enacted, that the standard for both gold and silver coins of the United States shall hereafter be such that of 1,000 parts by weight 900 shall be of pure metal and 100 of alloy; and the alloy of silver coins shall be of copper, and the alloy of gold coins shall be of copper and silver, provided that the silver do not exceed one-half of the whole alloy,"] is delivered over to the chief coiner in the form of bars or ingots of a certain weight, to be divided and shaped into pieces required for the currency of the country.

The *Coining* department of the establishment is of a power and efficiency sufficient to perform all the mechanical processes incidental to the issue of nearly 70,000,000 of pieces during the past year; and I was assured by Mr. Franklin Peale, the chief coiner, that it could have executed much more if it had been steadily employed, or fully supplied with material during the whole of that period. It is not necessary to go through the whole course of operations in this department, but to notice only such as possess novelty or present special characteristics.

The necessary power for working the machinery is obtained from a large steam-engine of the form usually known as the steeple-engine; it is a double vertical high-pressure-engine, with cranks at right angles, the power being carried off by a caoutchouc belt, 2 feet wide, from a drum of 8 feet in diameter; the estimated power is equal to 90 horses. At times, this is all required, at others much less is sufficient, and in uncertain proportions; to meet this irregularity, and to insure that steadiness of motion so necessary in such delicate operations, a governor and throstle value of a peculiar construction have been devised which have now been in use for some time, and have produced most satisfactory results, fully effecting the purpose for which they were designed.* The rolling mills, 4 in number, are driven entirely by belts, at the rate of 6 revolutions per minute; the distances between the rollers being adjusted by double wedges, moved by a train of wheels which are connected with a dial plate and bands, divided and numbered into hours and minutes, so as to indicate the proper thickness of the strips of metal without the use of gauges. Gold strips are heated in an iron heater by steam, and waxed with a cloth dipped in melted wax, and silver strips are coated with tallow by means of a brush. The draw bench is used for both metals, and trial pieces are cut from every strip and their weight tested, preparatory to the cutting of the whole.

The cutting processes are very simple and efficient, consisting of a shaft moved by pulleys, and a 2½-inch belt, with a fly-wheel of small diameter but sufficient in momentum to drive the punch through the slip of metal by means of an eccentric of three-eighth of an inch, at the rate of 250 pieces per minute, which skilled hands can readily accomplish and continue until the slip is exhausted. The annealing during the rolling of the ingots into slips is performed in copper cases, in muffles of fire-clay and brick, heated by anthracite coal, three muffles or hearths being kept at a bright red heat by one fire-grate or furnace, and the distribution and intensity regulated by dampers. These annealing furnaces are recent in their construction and very satisfactory in operation; they are heated by anthracite at the cost of about one-fourth the expense of the wood previously employed.

The whitening of planchets is performed as usual by inclosing the gold in luted boxes, and by exposing the silver in an open pan, to the heat of a simple furnace with wood fuel; the drying and sifting after the action of dilute sulphuric acid, is rapidly and effectually accomplished by a rolling screen—one portion of which, consisting of a pair of closed concentric cylinders, between which high-pressure steam is admitted. The blanks, with a sufficient quantity of light wood sawdust (linden or bass wood is the best), being introduced into the interior cylinder, a revolving motion is given to it by the engine for a certain time; the door is then opened and the blanks and sawdust gradually find their way into the wire screen by which they are separated, the movement being continued until the separation is complete, when the blanks are discharged at the end of the machine. An arrangement exists by which a slight inclination is given to the machine so as to direct the motion of the blanks towards the discharging end.

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* A full description of the engine, &c., is given in the Journal of the Franklin Institute for October, 1851, page 255.

The milling machines are, I was informed, peculiar to this mint, and are in a great measure original, the operation being performed by a continuous rotary motion, with great rapidity and perfect efficiency, varying in rate according to the denomination of the coin, between 200 and 800 pieces per minute, and at the same time separating any pieces that are notably imperfect.

It must be understood that the operation there termed "milling," is merely for the purpose of thickening and preparing the edge, so as to give a better and more protective border to the coin, the ornament or reed, commonly known I believe in this country as "milling," being given to the piece by the reeded collar of the die in which the piece is struck.

The coining presses, 10 in number, and milling machines are worked by a high pressure horizontal steam-engine, made from the design and under the direction of the present chief coiner, in the workshops of the establishment in 1838.

The presses are of 3 sizes, the largest applicable to the striking of silver dollars and double eagles:—the second to pieces of medium value;—and the smallest to the dime, half dime, and 3 cent pieces. The first is usually run at the rate of 80 per minute, the last at 104 per minute,—the average rate of the whole is 82 per minute. This rate can be increased if required.

If all the presses were employed in coinage at the usual rate, they would strike in one day (9 working hours) 439,560 pieces, and if employed upon gold, silver, and copper, in the usual manner, and on the usual denomination of coin, they would amount in value to $966,193.

During the past year, on one occasion 8 of the presses were run 22 out of 24 consecutive hours, and coined in that time 814,000 pieces of different denominations of coin.

These presses have been made principally in the workships of the Mint. They possess in common with the presses of Uhlhorn, in Germany, and Thouellier in Paris, the advantage of "the progression lever," "le genou" or "toggle joint," a mechanical power admirably adapted to this operation; but in almost every other particular they are original in arrangement, being the result of experience, beginning as far back as 1836.

In order to supply these presses various means have been devised; among them, and not the least important, is the "shaking box," in which advantage is taken of a disposition observable in similar bodies, or bodies of similar form, to arrange themselves in similar positions. This is a box, whose bottom is constructed with parallel grooves adapted to the size of the blanks or planchets to be arranged. A quantity of them is thrown indiscriminately into the box, which is then quickly shaken in the direction of the grooves, the pieces immediately lay themselves side by side in parallel rows, from which they can easily be lifted in rouleaux as required to be passed to the feeding tubes of the mills or presses.

It is very evident to all visiting the establishment that such a large number of pieces could not be coined and manipulated by such a limited number of hands without the aid of some labour-facilitating arrangements, one of the most worthy of remark of which is the method of counting the pieces coined—if counting it can be called, for in principle it is a measuring machine. The arrangement of this counting frame, or tray, may be understood from the following sketch of its construction.

A board or tray of such dimensions as may be required, is divided by a given number of parallel metallic plates dissected into its plane and slightly elevated above it, the edges of which rise no higher than the thickness of the coin for which it is intended. The board is of such a length as will admit of a few more than the required number of pieces to be laid longitudinally in the rows, and is divided across and at right angles with the rows, and hinged at a point opposite to a given number. One of those employed by this department counted 1,000 pieces, that is to say, it had 25 parallel grooves or rows sufficiently long to receive 45 pieces. Now, having thrown on this board a large excess of pieces, it is agitated by shaking until all the grooves are filled, and then inclined forwards until all the surplus pieces have slid off, one layer only being retained by the metallic ledge; the hinged division is then suffered to fall, which at once throws off all but the 45 pieces in the length of each row. This operation, somewhat difficult and tedious to describe, is performed in a few seconds, and results in retaining on the board 1000 pieces, each piece exposed to inspection, and the whole accurately counted without the wearisome attention —so likely to result in error—required under usual circumstances.

The very large number of pieces coined during the last year has been counted almost exclusively by two female manipulators, assisted by a man who had the duty of weighing them in addition as a testing check. The same amount of labour by ordinary means could not have been performed with fewer than thirty or forty hands, to say nothing of inferior accuracy. This machine was originally arranged and patented by the late R. Dyler, coiner of the New Orleans Branch Mint, but has been materially improved in its application and construction by Mr. Franklin Peale of Philadelphia.

The balances of the Mint of the United States have received the attention necessary to an instrument of such importance in mint operations. They have been arranged and made generally in the workshops of the establishment, and operate entirely to the satisfaction of the department. It is not necessary to enter into details of their construction, as a full and minute description is given in the Journal of the Franklin Institute for July, 1847. I, perhaps, ought to mention that since that appeared, some slight improvements have been made by inclosing all but the stirrups and pans in glass, by these means excluding dust and protecting them from the influence of air currents.

In concluding this brief sketch of the practical working of the two most important departments of the United States Mint, I cannot omit a reference to the very excellent remarks of the chief coiner on the employment of females in some of the operations in his department. This, he informed me, had generally excited the surprise of, and been commented upon, by foreigners who had visited the Mint. His experience, however, had led him to believe, that in places of trust, where no great physical exertion was called for, but where accuracy and strict integrity were of first importance, the moral perceptions of the female, generally stronger and of a higher standard than in the man, would qualify her as his substitute, and thus, while opening a new field of labour for the occupation of females, would strengthen their claims to it by the superior accuracy and economy of their work.

CLASS II.

CHEMICAL AND PHARMACEUTICAL PRODUCTS AND PROCESSES.*

The relations which exist between chemical knowledge and the industrial application of raw materials, are being strengthened each day by the rivalry of trade, induced by competing markets, and are each day becoming of more importance to, and consequently more readily acknowledged by, the manufacturing public. It is well nigh impossible to point out any process of manufacture in which chemical principles are not directly or indirectly involved, and in which much of the success is not based upon the correctness with which they have been carried out. In the United States, where manufacturing industry has of late years made such rapid advances, and where the energy and skill of her citizens have grappled successfully with the difficulties which obstruct the establishment of many of those important branches so largely developed in this and other old countries, I hardly expected to find that a manufacture so limited as that of chemicals would offer sufficient inducements for the application of their knowledge, and the employment of their capital and time. Upon enquiry, however, I found that although the chemical manufacturing establishments generally were not conducted upon any large scale, they were annually increasing in number, and were widely distributed all over the States, following close in the wake of other manufactures, and either supplying their wants or utilizing their waste products.

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* The Jury awards in reference to the articles exhibited in this Class, will be found in Mr. Dilke's Report, p. 14.

I was not able to obtain any statistical account either in regard to the quantity or value of substances manufactured, nor of the amount of capital invested in them.

In respect to the finer preparations, both chemical and pharmaceutical, such as the salts of quinia and morphia, mercurial preparations, &c., it appears that the home supplies are at present fully equal to the requirements of the country; and the same may to a great extent be said in reference to some of the heavier chemicals used in the arts, as sulphuric and other acids, alum, copperas, prussiate of potass, sugar of lead, sulphate of copper, &c. This remark, however, will not apply to chloride of lime, soda ash, carbonate of soda, the salts of ammonia (sulph., mur., and carbonate), of which large quantities are annually imported.

From the following list of the principal manufacturing establishments, a sufficient idea may be formed of the present condition, and development of the industry in the States.

In Massachusetts, in the vicinity of Boston, there are two or three chemical manufactories of some importance. The Roxbury Company, which makes sulphuric and other acids, alum, copperas, &c. The Salem Company makes the same articles and sulphate of copper upon a considerable scale. At Newton, there is an extensive manufactory of sulphuric acid, besides which there are two or three makers of preparations used by calico printers, &c.; but these are not upon a very large scale.

At Providence, Rhode Island, there is a manufactory of sulphuric acid.

In New York and its vicinity, there are a number of manufacturing chemists —more particularly of pigments and various coloured substances. These will be more directly specified in my remarks on the contributors to this Class in the Exhibition.

In New Jersey, at Newark, there is a manufactory of sulphuric acid, where chloride of lime and soda ash are also made.

Philadelphia has always been the principal seat of the manufacture of chemicals, and still furnishes a large proportion of the different preparations used in the States, whether for medical purposes or in the various processes of industry. Some of the establishments are upon an extensive scale. First amongst them, I may place that of Messrs. Powers and Weightman, whose excellent assortment of chemicals obtained for them a prize medal (Class II.), at the Exhibition of 1851, and who have again most creditably supported the character of their establishment, by the fine collection they sent to the Exhibition in New York, of which some particulars are subjoined. This firm has two distinct works, one situate in the city, where the finer chemicals, used in the arts and in medicine, such as salts of mercury, salts of morphia, salts of quinia, &c., are prepared; the other situate at Schuylkill Falls, in the immediate vicinity of the city, where they manufacture alum, sulphuric, nitric, and hydrochloric acids, aqua fortis, the sulphates of copper, iron, and magnesia, upon a tolerably large scale. Messrs. Lennig and Co. manufacture sulphuric, nitric, and hydrochloric acids, aqua fortis, alum, and copperas, largely; and also soda ash and chloride of lime to some extent. Messrs. Wetherill, Brothers, are extensive manufacturers of white and red lead and litharge. Messrs. M. and J. N. Lewis also manufacture white and red leads, litharge, and sugar of lead. Messrs. Harrison, Brothers, and Co. manufacture the same salts of lead, together with pyroligneous acid, alum, and copperas. Geisse, Brothers, make sulphuric, nitric, and hydrochloric acids, copperas, and some few other chemicals. Messrs. Maher and Landis have an establishment for making the same acids, &c. C. J. Crease makes chrome yellow, red and other colours, nitric acid and aqua fortis, but not sulphuric acid. Messrs. Potts and Klett manufacture Prussian blues and ultramarines, and some other colours, and also sulphuric acid. Messrs. Carter and Scattergood, and H. W. Worthington are large makers of prussiate of potass. W. W. Fleming makes oxide of cobalt and oxide of nickel, which are chiefly supplied to the English market; he is also a manufacturer of German silver, upon a large scale. Messrs. Rosengarten and Denis have an extensive establishment for the preparations of sulphate of quinine, and other medicinal chemical preparations.

At Baltimore, Messrs. W. Davison and Co. manufacture Prussian blues chromes, and some few other articles on a tolerably extensive scale. P. S. Chappell has a small manufactory of sulphuric acid, which however, is concentrated only in leaden stills. There is an establishment for the manufacture of different paint colours, carried on by Messrs. Poplin and Thomson, and also one or two others on a moderate scale, where white lead is made, and where the chrome ore, found extensively in Maryland and Pennsylvania, forms the basis of the manufacture.

At New Orleans, a sulphuric acid manufactory has quite recently been established, and another also within the past year, at St. Louis in Missouri. In both of these establishments the acid is concentrated in leaden vessels.

At Cincinnati, Grasselli and Co. manufacture sulphuric, nitric, and muriatic acids, alum, copperas, &c., on a very respectable scale. There are also two or three establishments for the manufacture of prussiate of potass. It is probable that in the course of a few years, this city will contain several important chemical works. The special advantages it offers for such operations are great. Being the great centre of the hog industry, where some hundreds of thousands are annually slaughtered and disposed of, very large quantities of refuse, fatty and other organic matters, will be always readily procured, while the rapid development and increase of the grape cultivation in its vicinity will annually augment the home production of crude tartar, an article of some value in a chemical point of view to several important arts and manufactures. Its proximity to the great bituminous coal field of West Pennsylvania and Ohio adds materially to its other advantages.

At Pittsburg there is an establishment for the manufacture of sulphuric acid, and at Tarentum, in its vicinity, the Pennsylvania salt and alkali works manufacture upon an extensive scale, soda ash, &c., and *caustic soda* for the use of soap boilers; of their method of manufacturing this latter I could obtain no information, neither could I obtain permission to enter their works. Their facilities for manufacturing are great owing to their proximity to the brine springs and to coal.

The foregoing list embraces only the principal makers of the more important chemicals, and my enquiry was directed rather to those employed in the various processes of manufactures than to those used for medicines, or for the finer purposes of the arts. In the Exhibition building, but few of the establishments enumerated were represented, the nature of the Exhibition offering, in a commercial sense, but little inducement to compensate for the trouble and expense attending the preparation and transmission of their goods. Although Class II. contained many valuable contributions, it can therefore hardly be said to have satisfactorily represented the condition of chemical manufactures in the United States. The following appeared to me most worthy of notice.

United States.—Messrs. Powers and Weightman, of Philadelphia, exhibited a remarkably fine collection of chemicals, both for industrial and for medicinal purposes. Amongst the former may be noticed a tub of alum of large dimensions and of very good colour, and some fine crystals of sulphate of iron, and sulphate of copper, and of tartaric acid. The latter portion included gallic acid, some extremely fine crystals of pure morphia, the salts of morphia,—sulphate, acetate, muriate, and valerianate; the sulphate, neutral sulphate, valerianate, ferrocyanate, citrate, iodate, arseniate, and muriate of quinine; pure strychnine in fine large crystals; the acetate and nitrate of strychnine; sulphate of brucine; santonine, fine crystals; picrotoxine, meconine, menispermine, caffeine, theine; tannin; with an extensive series of ethers and essential oils, transparent and all of good colours.

Charles Ellis and Co., of Philadelphia, exhibited a good collection of pharmaceutical preparations and chemicals, containing tannic acid in fine large crystals, oil of tobacco, &c.

Fearing and Akin, of South Yarmouth, Massachusetts, exhibited good specimens of magnesia both the heavy and light, carbonates and calcined.

Ludwig Brumlen, Poughkeepsie, New York, exhibited good specimens of sulphate of copper and of Paris green—a pure bright colour, obtained by precipitation from the sulphate of copper by the addition of arseniate of soda.

J. A. H. Bell, New York, exhibited a case of Paris greens in powder and mixed, and some American vermilion (sub-chromate of lead); colours all good.

Leo S. Root and Co., exhibited a case containing Paris greens, chrome yellow, Prussian blue, and chromate of potash; colours good and neatly arranged.

Hastings and Co., New York, exhibited "prepared crystals for polishing" (powdered quartz of different degrees of fineness), to be used instead of sand-paper.

J. Dixon and Co., Jersey City, New Jersey, exhibited black lead, crucibles, furnaces, &c.

Delluc and Co., Yew York, exhibited a case of chemical flavouring essences, comprising all those in ordinary use.

Isaiah Deck exhibited oxide of zinc, of good colour.

Ruffner, Donally and Co., Kanawha, Virginia, exhibited common salt in fine large crystals; also samples of the refuse and bittern, or mother-liquor.

S. C. Sheppard, Philadelphia, exhibited citrate of magnesia with excess of acid.

Williamson, Mann, and Co., New York, exhibited a large collection of powdered drugs.

W. H. Helmann, New York, exhibited a case of bronze and other metallic powders, Florence and metal leaf, &c.; very good and neatly arranged.

L. Brandeis and Co., New York, exhibited a case of bronze colours, gold, silver, and metal leaf; all good.

Sinclair and Co., New York, exhibited good specimens of Paris green, in powder and in oil.

J. Kohnstamm, New York, exhibited a case containing ultramarine (the only American made), carmine and lakes; colours all good.

Bullock and Crinshaw, Philadelphia, exhibited a large case of artists' colours, in powder and in cakes; all well prepared and very neatly got up.

H. G. and L. B. Hotchkiss, of Lyons, New York, exhibited essential oils of peppermint, spearmint, and wintergreen (*Gaultheria procumbens*).

G. R. Hendrickson, New York, exhibited some remarkably fine crystals of nitrate of potass (24 inches long).

H. W. Worthington, Philadelphia, exhibited fine specimens of yellow prussiate of potass.

Alter and Gillespie, Freeport, Philadelphia, exhibited bromine, of which they are the only makers; home consumption about 12 pounds per day.

C. Pfizer and Co., New York, exhibited refined camphor, naphthaline, benzole, creasote, and some salts of mercury.

F. Schols, New York, exhibited a large mass of sulphur.

Tilden and Co., New York, exhibited a good collection of pharmaceutical extracts, prepared *in vacuo*, according to the United States Pharmacopœia of 1850.

J. D. Perrins, Brooklyn, exhibited samples of acids, alkalies, and chemical salts, used in various manufacturing processes.

L. Leroy, New York, exhibited mannite in large crystals, tartaric acid, borate soda, arseniate of potass, and other finer chemicals.

Elmer and Hendrickson, New York, exhibited a case containing "alkaloids, resinoids and allied principles, active principles of indigenous and foreign medicinal plants," a large collection of remarkable products (?) *in powders* of a tinted brown colour, *none crystallized.*

T. J. Husband, Philadelphia, exhibited calcined magnesia; colour good, and on examination found to be chemically pure.

Rosengarten, Denis, and Co., Philadelphia, exhibited a case of fine chemicals, containing sulph. quinine, sulph. strychnine, sulph. morphine; the crystals large and of good colour: also strychnine, veratrine, and piperine, of good colour.

Rushton, Clark, and Co. exhibited medicine chests fitted up; also cod liver oil of good quality and colour.

Haskell, Merrick, and Bull exhibited a tolerably large collection of drugs in powder, apparently of good quality.

Kuno, Krause, and Co., St. Louis, Missouri, exhibited a good collection of chrome greens, yellows and reds of different tints, Paris greens, and Prussian blues, and Indian carmine (sulpho-indigotic acid).

H. Riofrey and Co., San Francisco, California, exhibited a good sample of sulph. quinine, said to be chemically pure, free from cinchonine.

In the *Foreign* division of the building some valuable additions were made to the general display of chemical and pharmaceutical preparations.

Amongst the most worthy of special notice were the collections in the *Zollverein Department*, exhibited by Dr. L. C. Marquart of Bonn, which contained oxide of uranium of excellent colour; nitrate of bismuth in fine bold crystals; bromine; nitro-benzole, used extensively in odorizing soaps; and several other artificial flavouring essences; solutions of gutta percha, and of caoutchouc, &c. Krimmelbein and Bredt, of Barmen, in Rhenish Prussia, exhibited a good collection of chemicals used by dyers and printers, comprising red prussiate of potass in large crystals; carbazotic acid in fine crystals; safflower carmine; stannate of soda, &c.

A special and detailed notice, however, is due to Gehe and Co., of Dresden, for the very comprehensive and admirable series exhibited by them, containing samples of mineral, vegetable, and animal substances used for chemical, pharmaceutical, and industrial purposes; chemical and pharmaceutical preparations, many of them of the most rare and expensive description; and an extensive assortment of apparatus suited for chemical and metallurgical operations. The latter portion, which come more correctly under Class X, contained several highly finished balances of different sizes; agate mortars; numerous cases of instruments,—hydrometers, testing cases, blowpipe apparatus, pneumatic pumps, batteries, &c.; various articles in glass and porcelain-ware; besides a large collection of slabs, mortars, and other heavy utensils in green serpentine.

The raw materials and the chemical and pharmaceutical preparations were disposed under two great divisions of "primary and secondary products," and were represented by specimens of upwards of 1,200 different substances, all of which were duly labelled and arranged in a case well suited to admit of their examination and study.

In the first division, "*raw materials*," the mineral substances most worthy of remark were the samples of *true* ultra-marine, four qualities, made at the Royal Porcelain Manufactory at Meissen, from *lapis lazuli*; bezoar stone; cobalt speiss or glance, in fine and perfect crystals; grey natural cobalt, from Sanschwart, in Saxony; hæmatite in large needles; native metallic bismuth combined with cobalt; native sulphate of arsenic, in very fine crystals; wolfram, in large crystals; uranium ore, from Georgenstadt; platinum and palladium, in sheets and slabs of different sizes, &c.

The *vegetable and animal* series comprised many substances with which we are familiar, and a few which are not so generally known, as "zibethum" (true civet), exhibited in a coloured glass bottle; albumen, from *blood* and from eggs, used extensively for printing purposes and also as a fining agent; musk, in grains and in its natural bag; lycopodium seeds; true sepia; dried misletoe; powdered pyrethrum caucasium (*Insecten pulver*), said to be poisonous to all insects, though not to man; decorticated licorice root, of very large growth, from Russia; *mummia*, mummy brain, impregnated with pitch, &c., &c.

The second division. *chemical and pharmaceutical* products, was more numerously represented, and contained many rare and interesting preparations, arranged, apparently, without any definite order, in ten divisional cases. Of these the following were the most remarkable:—Nos. 1 and 2 contained a large series of essential oils of fine quality, amongst them were exhibited the essential oil of cucumbers and the essential oil of mignonette (*Reseda odorata*).

In case No. 3, amongst other specimens of oils shown, was the oil of arnica, in a *crystallized form* (sold at $40 per oz.); also, salts of strychnine; nitrate of urea, in bold crystals; uric acid; molybdic acid; tungstic acid; alloxan; bichromate of ammonia: acetate of mercury, in fine pearly crystals; mucic acid; glacial phosphoric acid; chromic acid, in good crystals.

Case 4 contained the *essential* oil of eggs, and a small number of other oils and essences; also, oxide of chromium and potassa; sulphate of cadmium, in crystals; salts of silver,—the sulphate, nitrate, iodate, cyanide, chloride, carbonate, and acetate; amygdaline; mannite, used extensively in the adulteration of quinine; morphia salts, lupuline; potass salts, including the rhodonate, bromate, &c.; quinine salts,—sulphate, valerianate, acetate and muriate; collodion; chloroform; benzole; various ethers; *pure* alcohol; glacial acetic acid; various fruit essences, (amyl. compounds), with pine-apple essence (butyrate of oxyde of ethyl.)

In cases 5 and 6 were various essences, those of rum (lactate of amyl.), and of brandy, were very good.

Case No. 7 contained benzoic, succinic, and boracic acids, in fine crystals; lactate of iron, &c.

Case No. 8 contained some rare preparations, such as, iodoform; narcotine, menispermine, (*Menispermum cocculus*) : ononine (*Ononis spinosa*); oxycanthine (*Berberis vulgaris*); papaverine; peucedanine (*Peucedanum officinale*); picrotoxine (*Coculus indicus*); proteine; rhabarbine; rheine (*chrysophanic acid*); solanine, theobromine (*Theobroma cacao*); carvacrol (*Carum carui*); elaterine (*Momordica elaterium*); quassine; sanguinarine (*Sanguinaria Canadensis*); berberine; sulphate of berberine; atropine (*Atropa belladonna*); asparagine; asaron (*Asarum Europœum*); anemonine (*Anemone pulsatilla*); æsculine (*Æsculus hippocastanum*); aconitine; ergotine (*Secale cornutum*); elaterium, white and black; meconic acid, in good crystals; iodic, hippuric, quinoic, kinic, anemonic, chloric, perchloric, and formic acids; various salts of gold and platinum, carbonate of cobalt, lactate of zinc; carbonate, chloride, and sulphate of lithia.

In case No. 9 were specimens of hydriodate of ammonia; iodate of baryta; caffeine; citrate of ditto, good crystals; coneine; nicotine; indigotine; oxide of iron and soda, crystals; bruceine (*Brucea anti-dysenterica*); xylosteine, (*a resin found in peat bogs in Denmark*); cantharadine; cetrarine (*Cetraria islandica*); chelidonine (*Chelidonium majus*); quinidine, fine crystals; codeine, fine crystals (*Papaver somniferum*); colocynthine; columbine; cubebine; daturine (*Datura stramonium*); digitaline; emetine (*Cephaelis ipecacuanha*); filicine (*Aspidium filix Mas.*); gentisine (*Gentiana lutea*); glycyrrhizine; jalapine; hæmatoxyline; fine crystals; inuline (*Inula Helenium*); phloridzine, (bark of the root of apple and other trees;) pilphininine (?); valerianates of zinc, iron, bismuth, soda, and potass; bromoform; various salts of nickel, cobalt, lead and strontian; chloride of palladium, &c.; and choleate of soda.

Case No. 10 contained the rarer salts of magnesia, manganese, and soda; santonine; salicine; and a collection of curious vegetable extracts in powder.

A case containing a large and fine collection of alkaloids, with their salts, was exhibited by E. Merck of Darmstadt. There were fifty-one specimens, comprising amongst them, strychnine, atropine, and their salts; asparagine; menispermine; peucedanine; phloridzin; mannite; bebeerine (*Nectandra Rodiœi*) and salts; filicine; iodoform; digitaline; theobromine, &c.; all of good colour and well crystallised.

O. Hermann and Schönebeck exhibited a variety of pure chemicals, those most worthy of notice were glacial phosphoric acid; potassium and sodium, in large quantities; and succinic acid, in fine bold crystals, and of a remarkable white colour.

Trepte and Ferko, of Leipsic, exhibited various essential oils, and artificial flavouring essences.

Spahn and Schimmel, of Leipsic, exhibited a good collection of oils and essences, for flavouring purposes; those of rum and brandy were particularly fine.

Henrich Gademan, of Schweinfurt, exhibited a fine case containing ultramarines of various tints, and also greens; all of good colours.

Julius Curtius, of Dinsberg, Rhenish Prussia, exhibited ultramarine of four different qualities; all good.

J. N. Adam, Renwig, Bavaria, exhibited good samples of blue and green ultramarines; also samples of red and yellow prussiate of potass.

Wilhelm Buchner, of Darmstadt, exhibited samples of six qualities of ultramarine.

C. E. Fries, Heidelberg, exhibited samples of six qualities of ultramarine.

Puscher, Brothers, Nuremberg, exhibited samples of ultramarine, various dyes, ochres, chromes, and lakes of different tints, &c.

Zuber exhibited several samples of ultramarines; as did also Wolff and Co. of Schweinefurt, and widow Kohnstamm of Neiderweren, Bavaria, all of which were of good quality.

The Electoral Hesse smalt-works, at Schwarzenfeldt, exhibited an extensive and excellent collection of nickel and cobalt products and preparations.

G. H. Habich, of Cassel, exhibited a case containing preparations of indigo and Prussian blue, for colouring purposes; a very good collection.

Horstman and Co., Horst-on-the-Ruhr, exhibited a case of mineral colours; zaffre and zaffre salts.

C. W. Voigkt, of Thuringen, Saxony, exhibited samples of white-lead; also, prussian and indigo blues, prepared as fine colours.

The town of Reichenstein sent a case of arsenical products obtained by Güttler's process.

Leo Haenel, Munich, exhibited a good collection of bronze and other metallic powders.

Alwyn Rudel, of Halle-on-the-Saale, exhibited (Class X) a neatly-arranged case, containing chemical apparatus for analytical purposes, with balances, &c.

J. F. Luhme, and Co., of Berlin, exhibited (Class X) an extensive assortment of chemical apparatus of a larger size, comprising air-pumps and other pneumatic apparatus; batteries, balances, chests fitted up complete for mineralogical or chemical analysis, retorts, dishes, glass, &c., &c.

E. Gressler, of Erfurt, exhibited (Class X) a good collection of the larger chemical apparatus, with thermometers, and various chemical and philosophical instruments.

Netherlands.—In the Netherlands department a small collection of chemical apparatus was exhibited by I. R. F. Menergilt, in which the glass beakers, retorts, &c., were coated with copper by the electro-process, the surfaces having apparently been first covered with silver-leaf.

Italy.—In the Italian department the manufacture of boracic acid was represented by Count Larderel, although the series of products was not so complete as that which secured him the Council Medal in 1851.

Lorenzo Dufour, of Genoa, exhibited the sulphate and citrate of quinine, well crystallised and of good colour.

Antonio Puccio, also of Genoa, exhibited samples of sulphate of quinine.

Albani Fratelli, of Turin, exhibited a variety of chemical productions: the soaps, phosphorus, and matches, gelatine, &c., were well prepared.

J. B. Aquaroni, Porto Maurizio, Genoa, exhibited samples of concentrated lemon-juice for ship's use, which remained perfectly clear and unchanged during the period of the Exhibition.

France.—In the French department but few articles were exhibited which claim particular notice. Some small samples of ultramarine were exhibited by Bonzel, Brothers, of Haubordin (Nord). Louis Viard, of Paris, exhibited a collection of colours and varnishes; and Le Fevre, Senior, of Nantes, exhibited specimens of his oxide of zinc in small bottles.

Austria.—In the Austrian department a large case of colours was exhibited by Kinzelberger and Co., of Prague, containing 180 different samples; the whole neatly arranged and colours good.

J. Setzer, of Weiteneck, on the Danube, exhibited ultramarines, and madders of various shades; and sulph. cadmium of a fine bright colour.

W. Petz, of Pesth, exhibited some very excellent samples of carmine.

L. and C. Hardmuth, of Budweis, Bohemia, exhibited samples of Naples yellow.

J. von Herbert, of Klagenfurt, exhibited samples of white lead of very good colour, also samples of litharge, &c.

Wenzel Batka, of Prague, exhibited a very good collection of chemical apparatus in glass and porcelain, agate mortars, models for crystallography, small chests fitted up for dry and wet analyses, &c.

Cuba.—From Cuba a very large sample of sulphate of quinine, of good colour and well crystallised, was exhibited by A. Sauto, who also sent several other pharmaceutical preparations.

Great Britain.—The chemicals exhibited in the English department were upon a very limited scale, and were contributed principally by Messrs. Howards and Kent, whose case contained a good series of cinchona salts, and some of the preparations in ordinary use; by Thomas Jennings, of Cork, who exhibited magnesia, carbonate and calcined; and by one or two other houses, whose collections contained no articles worthy of remark.

In the *Canadian department* some cod-liver oil of very fine quality was exhibited by F. and M. l'Esperance, of Quebec. Samples of potash, containing 90 per cent. of alkali, were sent by P. Brennan, of Montreal, and W. Lyman and Co., of the Lachine Canal Drug Mills, exhibited a good collection of powdered drugs and various pharmaceutical preparations.

CLASS III.

SUBSTANCES USED AS FOOD.*

The articles exhibited in this class did not comprise so large a variety of substances used as food as might have been expected, considering the vast extent of country and the great natural advantages, both as to soil and climate, which the United States enjoy. The staple products, grain, tobacco, and rice, were, however, creditably represented, and some of the equally important industries excited general interest, and fully justified, by their exhibits, the share of public attention which they received.

Of these, perhaps, the most important for many reasons, is the rapidly-increasing cultivation of the grape, and its manufacture into wine. Several producers exhibited specimens of their respective brands, though the wines represented the vineyards of Missouri rather than of the valley of Ohio, which is the principal seat of the wine industry. From this latter district some two or three samples were sent, of which one was the produce of the vineyards of Mr. Rehfuss, whose name is so well and honourably known in connection with the vine-cultivation of the States. From Missouri there were some 8 or 10 exhibitors, good evidence of the progress and competition of the trade in the South-western States. The only other vine-producing State represented was South Carolina, from which a sample of wine was sent by Dr. S. C. McDonald, of Aiken, who not only exhibited samples of the pure Catawba, but also wines made up to imitate the different European wines.

These wines are the representatives of an industry still in its infancy, but which is increasing with such vigorous and healthy growth as to bid fair to be one of immense importance, socially as well as commercially, to the Western States. The advantages attending it were so evident that I felt it desirable to make myself acquainted, as far as possible, with all its details, as it appeared to me that such information would be valuable in reference to some of our colonies, Australia, Van Dieman's Land, and possibly New Zealand, where the physical conditions of the country seem to be sufficiently approximative to favour the cultivation of the grape and its manufacture into wines. Should such be the case, and a vineyard cultivation be introduced successfully, I think we may fairly expect the money results to be no less satisfactory than those which I am about to detail; while the effect on the country and the population will be seen in an advanced system of agriculture, where skilled labour is needed, and amply remunerated from the increased return readily obtained from the soil, and in the improved moral condition of the labouring classes, who would lay aside, to a greater or lesser extent, their usual strong and exciting drinks, for the cheaper and more grateful production of their adopted country.

Although this industry dates back but a very few years, still records exist of wine having been made in North America nearly three centuries since. According to the testimony of Sir J. Hawkins, related by Redding, we are told of wine having been produced from the native grape in Florida in 1564; and we are told also that it was at a very early period produced in Louisiana. The celebrated traveller Volney, on a visit in 1796 to the French settlers at Gallipolis, in Ohio, mentioned that he had drunk wine made there from a small red grape which had been found growing on some of the islands in the river, and thence transferred to a vineyard. Dufour, in 1799, relates that while journeying down the Ohio he found at Marietta a Frenchman who had commenced making wine from a vineyard planted with probably the same grape, indigenous to the islands of that river; however, he reports that he saw nothing worthy of the name of a vineyard, although he went far and wide, even as far as Kaskaskia, on the Mississippi, where he had been informed the Jesuits had planted a vineyard shortly after the first settlement of the country, but that the French Government had ordered it to be destroyed, lest the cultivation of the vine might so increase in America as to affect the wine-trade of France.

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* The Jury awards in reference to the articles exhibited in this Class will be found in Mr. Dilke's Report, p. 18.

At the commencement of the present century attempts were made at vineyard cultivation in several parts of the Union: at Gallipolis, in Ohio; Philadelphia, and other places in Pennsylvania; at Lexington and Glasgow, in Kentucky; Baltimore, in Maryland; at Monticello, in Virginia; and at New Harmony and Vevay, in Virginia; and subsequently these were carried into the States of New York, Alabama, North and South Carolina, and the District of Columbia.

However, these attempts were not very encouraging, failures generally followed, owing mainly to the grapes, which were imported from abroad, not being suited to the soil and climate. These failures had their effect upon some few of the most observant cultivators, who immediately renewed their attempts with the best of their native varieties. The Cape, Catawba, and Isabella, in the North, and the Scuppernong, in the South, took the place of the foreign vines, the vineyards flourished, and wine was made, but of inferior quality. Still they were not disheartened. Having succeeded in bringing their native grape into regular cultivation, they turned their attention towards improving its qualities, both by careful treatment and a judicious system of crossing; and the result is now shown in the rapid increase and prosperity of this new industry, with whose development the name of Nicholas Longworth is so honourably connected.

At the present time there are upwards of 3,000 acres in grape cultivation, of which 1,500 are in the district round Cincinnati, and 500 more in other parts of the State of Ohio. In Missouri, in Hermann county, there are about 500 acres, the area rapidly extending every year. In Indiana, from 200 to 300 acres; in Illinois, upwards of 100, and about the same quantity in Kentucky.

There appear to be about 12 varieties of native grapes in cultivation. *The Catawba,** to which common consent assigns the head place in the list, takes its name from the Catawba river, is a native af Buncombe county, North Carolina, whence it was obtained by Major Adlam, and first brought into cultivation by him at George-town (District of Columbia), and by Mr. Longworth in Ohio. Both still and sparkling wines are made from it; the colour is generally pale straw or pinkish. When the grapes are fully ripened, no sugar is needed in the fermentation.

The Cape, now known by the Wine-Growers' Association as the Schuylkill grape, the former name being a misnomer, though the favourite of former days, is now almost entirely displaced by the Catawba. It is hardy, not so liable to be affected by mildew and rust as the Catawba; requires the addition of some sugar to assist fermentation, and then makes a good wine resembling claret. It is still in cultivation in the vineyards, but not to any extent.

The Isabella is more generally cultivated as a table than as a wine grape; it is hardy, ripening somewhat irregularly, and making a medium white wine resembling Madeira, but requires the assistance of a large proportion of sugar; from 1 lb. to 1½ lb. to the gallon. It arrives at a greater perfection in the Eastern States than in the Western. In New York and the North-eastern States it is a great favourite.

Bland's Madeira resembles the Catawba in appearance, and is an excellent table grape, though too delicate for general cultivation; grapes small, dark coloured, and without pulp. It makes a dark red wine, which requires keeping to give it condition.

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* The Catawba, according to Dr. Mosher, was discovered by Colonel Murray on the banks of the river, from whence it takes its name, in Buncombe county, North Carolina, in 1802. It has been also found high upon the Arkansas river in about the same parallel of latitude 35° 30′, and on the same thin and gravelly soil. The Scuppernong is the favourite wine grape, south of latitude 35°; north of that it loses its character, and is not sufficiently hardy to stand the winter climate.

The Ohio is also a fine table variety, too delicate for general purposes. In suitable situations it bears well.

The Lenoir is a small black grape very sweet and agreeable; not generally cultivated.

The Missouri is also a black grape; berries sweet and without pulp. This variety is greatly esteemed in some districts, and makes an excellent wine resembling Madeira.

Norton's Seedling has small berries, sweet and of a purple tint, but makes only an inferior wine.

Herbemont's Madeira bears well; small berries, dark coloured, and without pulp. It is cultivated both as a wine and a table grape, and makes a wine of a pink or light red colour, resembling in flavour the Spanish Manzanilla.

Minor's Seedling.—A new grape of the "fox grape" family, is a very hardy variety, little subject to mildew and rot, and bears good-sized bunches of large, pulpy, and very highly-flavoured berries. These require to be mixed to some extent with other varieties, as they produce a wine too musky and high-flavoured to be agreeable. Owing to its hardiness and good bearing qualities, it is likely by cultivation to become a valuable addition to the vineyard.

White Catawba.—Another new variety, a seedling from the Catawba, but, as far as experience goes, far inferior to it. The berries are white, full-sized, and pulpy; the wine has not yet been tested.

Mammoth Catawba.—Another new seedling from the Catawba. The bunches are large, berries round, large and pulpy; in some seasons subject to drop off before ripening. Their flavour is not equal to the old stock, and the wine has not been tested.

Mr. Longworth, in a communication to the Canada Horticultural Society, remarks—"That he has for 30 years experimented on the foreign grape, both for the table and for wine." Many years ago he obtained a large variety of French grapes from the vicinity of Paris and of Bordeaux. From Madeira, he imported 6,000 vines of their best wine grapes, but not one of them was found to be worth cultivation in the latitude of Ohio. Subsequently, as a last experiment, he imported 7,000 from the mountains of the Jura, in the vicinity of Salins, embracing upwards of 20 varieties of the most esteemed wine grapes of France, with which at first he was more successful. After a trial of five years, however, they have all been thrown away, and he declares it to be his conviction that to cultivate the grape for wine purposes successfully, reliance must be placed on the native grapes of the country, and on new varieties raised from their seed. He has now an experimental vineyard adjoining his residence, in which he is cultivating some 80 varieties of European grapes in order to test their qualities and suitability for crossing with the native grapes.

There is some little difficulty in arriving at an average estimate of the cost of establishing a vineyard owing to the general absence of statistics incidental to new countries and to new industries, and also to the various modes by which they are brought into operation. It has hitherto been a very general custom to give a piece of land—say from 10 to 20 acres, with a suitable house on it to a vine-dresser (generally German, sometimes French or Swiss,) on a lease for a certain time, the tenant covenanting to plant it, and perform all the necessary operations in a proper manner, and within certain limits as to time, and to pay the proprietor annually, who usually furnishes the roots and cuttings for the first 2 or 3 acres, one-half of the proceeds. Under this arrangement everything depends upon the tenant; if he be successful, the return to the landlord is good and the outlay insignificant. In two cases I have been able to obtain a statement of the cost of establishing a vineyard upon which perfect reliance may be placed.

The one is that of Mr. Buchanan, a gentleman to whom I am personally indebted for most of these details, and whose cultivated taste and perfect acquaintance with the subject are no less valued by his colleagues and fellow-citizens than by those strangers who, by kindred tastes and pursuits, are brought in contact with him.

Cost of preparing a vineyard of six acres, containing 14,400 vines:—

	Dollars.
Trenching 2 ft. deep, at $65 per acre	390
Sodding avenues, at $10	60
Cost of 30,000 cuttings, at $2 50 c.	75
Planting	70
14.500 locust stakes at $3 per 100	435
Setting ditto	55
Cost of attending the first year, vine-dresser at $216, and a man for one month at $15	231
Second year, vine-dresser at $216; man two months, at $30	246
Cuttings to replace failures, about	20
Carting, &c.	68
Contingencies	150
Total	$1700

or nearly $300 per acre, irrespective of the rent, &c., of the land during the two years.

In a locality where the cuttings can be disposed of at from $2 to $2 50c. per 1000, it will reduce this aggregate about $100, or at all events sufficient to be a set-off against the cost of replacing stakes, manuring, &c., which is, from time to time, needed.

From Mr. Resor's statement, which includes the cost and returns of his vineyard for nine years; it appears that an acre planted 3 × 6 feet, containing 2,300 vines, cost him $284, to which, adding labour for two years, $50, makes the total amount to $334 per acre, or $34 more than the foregoing. It appears Mr. R., however, used two years' old vines, which cost him $125 more than cuttings could have been purchased at, which would reduce his acre, had he used cuttings, to $209, when first in bearing.

As an average estimate, Mr. Buchanan says that we may put the cost down at $200 to $350 per acre, depending on the economy and good management of the proprietor no less than on the situation and local circumstances of the vineyard.

Labour.—The annual labour required is given at $60 per acre.

For a vineyard of six acres:—

	Dollars.
Vine dresser, per annum	240
Labour to assist in pruning	25
„ spring culture	40
„ summer ditto	55
Total	360

or $60 per acre.

Although I do not think it necessary to enter into the details of the method of cultivation pursued, which appertain more directly to practical agriculture, one point, however, I wish to claim some attention to, as involving important scientific principles, which, if confirmed by further experience, may materially affect the future condition of other cultivated crops, and be an important and valuable addition to our knowledge of the physiology of vegetable life.

Mr. L. Rehfuss, one of the most skilful as well as scientific members of the Wine-Grower's Association, has promulgated a theory, founded on his own observations, which, if supported by continued experience, must be of great importance to the wine industry of the States generally. An objection existed in the Ohio wines on account of their acidity, which induced Mr. Rehfuss to submit them to a careful examination, when he found that it was due to the excess of *malic acid* present in them. This organic acid, in combination with bases, forms very soluble salts, which are not precipated by alcohol, while *tartaric acid* does the reverse. The soils, too, when submitted to analysis, exhibited a deficiency of potash as compared with the vineyards of Europe. He therefore concluded that the addition of potash salts were required in the soil. This experiment was successful; the wine of that vintage was found to be greatly improved, to have a less per centage of free acid, and to form a largely increased proportion of tartar.

The size of the vineyards vary considerably, as the expenses incurred in forming them are very heavy, and consequently only small pieces of land are taken in hand at a time. Much of the work, too, is done upon a sharing system by men, chiefly foreigners, of limited means, who rely rather on their own labour and that of their family than upon hired assistance. We may arrive at something like an average estimate by taking the Cincinnati district as a type. There appear to be about 1,250 acres in grape cultivation, in the occupation of about 300 persons, either as tenants or proprietors. This would give an average rather exceeding four acres to each vineyard; and this estimate is confirmed by that of Mr. Longworth's estate, which comprises 122½ acres cultivated by twenty-seven tenants.

The duration of a vineyard seems to be considerably affected by the mode in which it was in the first place planted. If the land is merely ploughed, it appears to be worn out in about fifteen years, the seventh year giving the highest return. If ploughed, and then subsoiled, it is considered as good for twenty years; but if the ground is trenched two feet deep, well drained, and properly attended to during the growth of the vines, the vineyard is then considered as a permanent one, and will remain productive as long as these conditions are secured. The crop is always more certain on such land, not being so liable to suffer from the effects of a dry or wet season, mildew, or rot. One of Mr. Longworth's vineyards, planted on ground well trenched, &c., twenty-eight years ago, is still in vigorous bearing.

The average produce per acre may be taken, one year against another, at 250 gallons: in many cases this has been greatly exceeded. In Mr. Resor's statement, for instance, he gives the expenses and returns of his vineyard for nine years, from 1837 to 1845, which shows an average per year of 480 gallons per acre. Other authorities give still higher returns. In 1846 we find Mr. Reort's vineyard of two acres yielded 1,300 gallons; and on Mr. Longworth's property, selected portions produced at the rate of 1,470 gallons per acre. The bucket of grapes from the vine will yield from three to three and a-half gallons of juice, according to the season.

In the wine-making process there is nothing new. The cost for gathering, picking, pressing, and vatting, may be taken at from $20 to $30 per acre. The price is determined, as a matter of course, both by the season and by the character of the vineyard. Probably, taking the average of years and of growers, $1 per gallon would be the proper estimate of its market value. Those who have storeage-room and capital sufficient to allow them to hold it in stock a certain time, readily realize from $1 25c. to $1 50c. per gallon. This was the current price in Cincinnati during the last autumn. By this, however, a loss is sustained, due to fermentation, evaporation, lees in racking, &c., equal to about 10 per cent. When the wine has been kept until it is sufficiently ripe for bottling, the price may be taken at $2½ per gallon, in large quantities, and $3 in smaller. The *sparkling* wine requires to be kept eighteen to twenty-four months. The *still* is never bottled until the fourth year.

The money-return, however, is satisfactory upon the outlay. If we take the cost per acre at $300,

	Dollars.
The interest at 6 per cent. would amount to ..	18
Annual labour	60
Expenses on making wine	25
Total	103
Estimated average return per acre, 250 gallons at $1	250

Giving a profit balance of $147.

This balance would be chargeable with the annual value of the land as rent, if in the hands of the proprietor; or if carried on under the share system, it would be divided between the two, the owner and the occupier of the land. In either case the profit it presents appears satisfactory.

There are two sorts of wine made, the sparkling and the still Catawba. Of these, Mr. Longworth and Messrs. Zimmermann are, I believe, the principal makers; there are, however, many others, whose brands bear a high character in the market. Both their establishments are upon an extensive scale, and their stock of wines large.

Mr. Longworth bottled, of *sparkling* Catawba, in 1850, 50 000 bottles;

in 1851, 75,000; in 1852, 110,000; and he expected in the past season to be able to bottle fully 150,000 bottles, besides selling from 30,000 to 50,000 bottles in the cask to the German population. Messrs. Zimmermann only bottle the *still* wine; this requires a long period in the vat to fully perfect the fermentation, and subsequent cleansing; their trade is consequently less advanced than that of the sparkling wine, which goes to market much sooner. In 1852 they bottled to the extent of 30,000; in 1853, about 50,000, which amount will be fully doubled, I was informed, in 1854.

Quite recently, too, they have commenced making brandy, a sample of which, made by Messrs. Zimmermann, I had an oportunity of tasting, which was of very excellent quality. It is found that sufficient "pumice" or "mark" is obtained from 1,000 gallons of wine to produce from fifteen to eighteen gallons of brandy.

The selling prices of the wines in the market are from $8 to $12 per dozen for *still*, and $10 to $15 for *sparkling* wines, and the demand is greatly beyond the rate of supply. The price asked for the brandy was $3 50c. per gallon, but I could not learn that any had yet been sold.

It is estimated that in five years the wine produce will be five times its present amount, owing to the increasing extent of acreage being put under vineyard cultivation, stimulated by the great demand for the wine, and the remunerative prices which it consequently fetches in the market.

From the foregoing details it appears that the present condition of the wine industry of the States is represented by 2,000 acres of land in vineyard cultivation, which at an outlay of $300 per acre would give an invested capital of $600,000, and would furnish direct employment for labour to the amount of $120,000 per annum, irrespective of coopers, &c. Allowing two-thirds of the vineyards to be in bearing, their produce would in the process of wine-making require an outlay for labour equal to $35,000, and the manufactured result would be a gross produce of 350,000 gallons of wine. Giving an average value to this of $1 per gallon, and deducting 10 per cent. for loss, &c., we have a nett return of $315,000 per annum. This does not make allowance for the wear and tear of the plants, &c., neither does it include the brandy manufactured, of which 5,250 gallons ought to be made from the lees of 350,000 gallons of wine,—nor of the crude tartar which at present is not preserved.

A fine sample of Kentucky tobacco was exhibited by French, Lyon, and Tabb of Dovor, Kentucky, in hogsheads, as packed for market. The leaves appeared to have been picked when fully ripe, dried slowly, and then pressed in the usual way. Some of the leaves were of large dimensions; one measured 37½ by 14 inches: the quality was excellent. Wm. Greaves exhibited samples of Cavendish tobacco. This is known as chewing or plug tobacco, and is put up in boxes of various sizes. Those exhibited weighed 38 lbs., and were of different qualities, to which different names and prices were attached.

	Dollars.	
Ladies' love! sold at	16	per box.
Ladies' twist!	13	„
Fair American!	10	„

Tobacco for smoking is either in leaf or cut up into fine shreds; for chewing it undergoes a process of gradual fermentation, and is then sweetened by the addition of molasses, and either done up into rolls, or pressed into cakes. The former is known as twist, the latter as plug tobacco. A good chewer, I was informed, would dispose of from 4 to 8 oz. per day

There were several other exhibitors of raw and manufactured tobacco. The two mentioned, however, represented the best in their respective manufactures. The Missouri samples were very good, the colour of the leaf being of a lighter colour than the Virginia and Kentucky and having a more fully developed skeleton or midrib.

Specimens of tobacco, cultivated in Connecticut, were exhibited by Keller and Co., of New Hartford: the quality was excellent, and the superior price it fetched in the market showed the estimation in which it was held.

A good case, containing fine bold samples of Ohio seed leaf tobacco, was sent by Messrs. Harkenburgh and Co., of New York.

The tobacco cultivation is so peculiary identified with the United States, and its history is so well known that but little need be said in reference to it.

The statistics furnished by recent Treasury returns, and by the last Census, however, furnish some interesting points in relation to this important staple of American produce. The principal varieties cultivated in the States are the Virginian; the large-leaved; the dwarf; the Cuba; and the common green tobacco. Its cultivation, from the following statement seems to be pretty general throughout the States of the Union.

RETURNS of TOBACCO raised in the UNITED STATES IN 1850.

	lbs.
New Hampshire	50
Massachusetts	119,306
Connecticut	1,383,932
New York	870,222
Pennsylvania	57,619
Maryland	21,199,281
District of Columbia	15,000
Virginia	56,516,492
North Carolina	12,058,147
South Carolina	73,235
Georgia	420,123
Florida	982,584
Alabama	163,605
Mississippi	48,349
Lousiana	23,922
Texas	60,770
Arkansas	224,164
Tennessee	20,144,380
Kentucky	55,765,259
Ohio	10,489,967
Michigan	2,225
Indiana	1,035,146
Illinois	844,129
Missouri	17,038,364
Iowa	2,012
Wisconsin	768
California	1,000
Oregon	325
New Mexico	1,118
Total	199,532,494

From these returns it appears that the production of tobacco has decreased nearly 20,000,000 lbs., during the ten years' interval between 1840 and 1850, while the home consumption appears to have increased not only in proportion to the population, but also in the ratio per individual.

This is shown by the relation between the gross population and the nett home consumption in the two years 1840 and 1850 respectively. In 1840 the crop amounted to 219,163,319 lbs., and the imports (chiefly cigars, &c., from Cuba) 346,035 lbs., making a total of 219,509,354 lbs. If from this is deducted the quantity exported (as leaf tobacco, manufactured, and snuff), 184,965,797 lbs., the difference will be 34,543,557 lbs., which taking the population at 17,069,453, would be equal to a consumption of 2½ lbs. per head per annum. In 1850, the crop amounted to 199,532,494 lbs., and the imports to 4,807,858 lbs., making a total of 204,339,352 lbs. After deducting from this the quantity exported 122,406,780 lbs., the balance left is 81,932,572 lbs., which divided by the population 23,080,972, represents a consumption equal to 3½ lbs. each.

A very good collection of plain and fancy samples of vermicelli and macaroni, was exhibited by Billing and Vogel of New York, well and tastefully prepared, and apparently of good quality.

Two well known firms, Hecker, Brothers, of New York, and Raymond, Schuyler and Co., of West Chester county, New York, exhibited samples of their cereal manufactures, including Indian corn, and its preparations, as samp (the corn with the skin and soft portion removed); hominy, (corn, bran and all, ground coarse); common meal, ditto ground much finer; wheat, different varieties of meal from ditto; barley, pearl barley, ground barley,—a good article. These prepations are well known in this country, both exhibitors having received a prize medal in 1851. A similar collection was exhibited by H. G. and L. B. Hotchkiss, of Lyons, New York, whose articles were also exhibited in 1851, and honourably mentioned by the jury of Class III. Samples of buckwheat flour were exhibited by W. B. C. Carpenter of New York, large quantities of which are annually consumed for cakes, &c.

Walter Baker and Co., of New York, exhibited samples of cocoa and chocolate of good quality, and very neatly arranged.

Joseph Govaerts, of New York, also exhibited a good assortment of prepared chocolates.

G. C. Gussen, of New York, exhibited samples of mustard, prepared according to the American, English, French, and German methods; and numerous samples of mustard, and various spices of condiments, both raw and prepared, were exhibited by Charles W. Walker of New York.

Some excellent samples of sugar were exhibited; those by Havemeyers and Moller, of New York, and by the Right Reverend the Bishop of Louisiana, were the most worthy of remark; the colour was good; the crystals, large, &c.

Although it appears from the State documents that the cultivation of the sugar cane, which had been introduced from St. Domingo by the Jesuits in 1725-6, was strongly encouraged by the French in the early days of the colony of Louisiana, it had not been carried into effect to any extent until about the year 1764, when we find that samples of the produce were sent over to the mother country, by the Chevalier de Mazan, which were pronounced to be equal to the St. Domingo sugar. The cession of Louisiana to Spain, about that period, acted as a check to the rising industry, as no further accounts of sugar-making are to be obtained until 1791, when the first sugar-house was erected under the auspices of the government at St. Bernard. This in the course of the next few years, was followed by others, which together seem to have established the basis of the sugar industry in the State. Its progress, however, at first was not very encouraging; and at the cession of Louisiana to the United States, the number of acres in sugar cultivation showed but a trifling increase. The early statistics from 1800 to 1818, are so deficient as to afford no very satisfactory information; in that year we find the total crop given at 25,000 hogsheads, the whole of the manufacturing operations being carried on by animal or manual labour. In 1822, steam-power was introduced, and an increased production is shown, now amounting to 30,000 hogsheads. This increase was kept up in a regular and very satisfactory ratio for the next ten years; the crop for 1832-3, having produced 70,000 hogsheads. In 1842-3, the returns give a crop of 140,316 hogsheads, or an increase equal to 100 per cent. in the ten years. By the Census returns for 1850, we find the total crop of the States to amount to no less than 272,964 hogsheads, which were contributed by the following States in the proportions given.

	Hhds.
Alabama	28
North Carolina	½
South Carolina	150
Georgia	1,273
Florida	1,741¼
Mississippi	278¼
Texas	7,017
Louisiana	262,486
Total	272,964

Louisiana, as may be seen, is still the principal locality of the sugar cultivation, which according to Champomier (annual statement), extends along both sides of the Mississippi, from 57 miles below New Orleans, to about 190 miles above. It is also cultivated on the Red River, including Rapides and Avoyelles, and on the bayous Lafourche, Terrebonne, Little and Great Caillou, Teché, Sale, Atchafalaya, and others, and the prairies St. Martin, Vermilion, &c. He gives the production of this State for 1851-2, at 236,547 hogsheads, equal to 257,138,000 lbs., which were made by 1,474 sugar houses, of which 914 were worked by steam-power, and 560 by horse-power.

For 1852-3, he gives the aggregate crop of the State, at 321,934 hogsheads which comprises 275,671 hogsheads brown, made by the old process, and 46,263 hogsheads refined, clarified, &c., having a total weight of 368,129,000 lbs., and showing an increase over the crop of the previous year of no less than 85,387 hogsheads. The crop was remarkably well got in, and was not only the largest ever raised in the State, but was also of very superior quality, the season having proved remarkably favourable, particularly on the banks of the Mississippi river and bayou Lafourche.

The following is the estimated yield of the State for the last ten years, which exhibits an irregular but heavy increase in the amount of production.

	Hhds.		Hhds.
1842–3	140.316	1848–9	220,000
1843–4	100.000	1849–50	248,000
1844–5	200,000	1850–1	211,000
1845-6	187,000	1851–2	236,500
1846–7	150,000	1852–3	321,934
1847–8	240,900		

The rate of increase may be more clearly illustrated by taking the average of the crops at intervals of five years, for the last twenty years.

	Hhds.		Hhds.
Aggregate amount of crops from 1833 to 1838	340,000	average	68,000
1838 to 1843	502.000	„	100,400
1843 to 1848	877,000	„	175.000
1848 to 1853	1,237,700	„	247,500

It is also stated by him that, in a recent tour through the sugar-making districts of the State, he ascertained that no less than 410 cotton estates are now in full preparation to go into the sugar cultivation.

Notwithstanding the large home production of sugar, the demand still continues ahead of the supply, the following quantities having, according to the official returns, been imported into the United States, during the periods for which the home production has already been given, viz:—

	lbs.		lbs.
1818	51,284,983	1846	128,028,875
1822	88,305.670	1847	226.683,261
1832	66.451,288	1848	248,201,117
1842	173,863,585	1849	253,815,495
1843	71,335.131	1850	197,651,819
1844	186,804,578	1851	364,537,861
1845	115,664,840		

The largely increased production of beet-root sugar in the Continental States has been in advance of their increase in consumption of sugar, and consequently has been the means of throwing large quantities of Cuban and West Indian sugar on the American markets.

Morell D. Bowen of Chenango county, New York, exhibited several pine-apple cheeses, well made, and of good flavour, though they suffered a little from the great heat in the building.

Preserved milk was exhibited by Gail Borden, whose preparation termed "meat biscuit," received a Council Medal in 1851; and by C. Alden of New York, prepared either for direct use, or in combination with coffee, chocolate, &c.

In concentrating milk for the purpose of preserving it for future use, a difficulty always presents itself in regard to the sugar of milk being so sparingly soluble in water as compared with ordinary sugars. This, by concentration of the milk, becomes crystallised, and then is with difficulty redissolved when the milk is required for use. To obviate this it is customary to remove the crystallised portion, and to substitute the more soluble cane-sugar for it.

The use of preserved milk has increased much of late years, owing to the great increase in marine travelling; for home purposes it is now of less importance, as the facilities of railway carriage for bringing up daily supplies from wide districts of country to the large central points, are so great, that good and pure milk ought to be obtainable in all the larger cities, as well as in the rural districts. With us in London, however, constant and serious charges are made in respect to the quality of milk supplied by the dealers; and it appears upon enquiry that our friends at New York have fully as much cause for complaint as we have.

In a recent number of Hunt's Merchant's Magazine, a paper appeared containing a digest, with some additions and remarks on a pamphlet "On the Milk Trade of New York," published during the last winter. From this we glean some curious though unpleasant statistics, in reference to the milk supply, dating back to the period immediately preceding the introduction of country milk, through the medium of railway conveyance.

In 1841, it was estimated that the supply of milk to the City of New York, was about 16,405,000 quarts or 45,000 quarts daily; a very small portion of which was *pure*; the entire trade being in the hands of the *swill milk* manufacturers. Now (1852) the total consumption amounts 270,000 quarts daily, or nearly 100,000,000 quarts annually.

According to the returns of the four principal railways, carrying milk into New York, for the year 1851, we find that there were carried by the

	Quarts.		$	c.
Haarlem Railroad	12,634,178,	selling at	63,120	89
Erie Railroad	12,610,556,	„	63,052	78
Hudson River Railroad ..	596,338,	„	2,221	72
Newhaven Railroad ..	90,732	„	4,336	69
Total ..	26,658,404,	„	132,726	08

The returns for the first half of 1852, again show a considerable increase, the quantities being by the—

	Quarts.	Freight.
		$
Haarlem Railroad	7,789,318	38,946
Erie Railroad	6,402,230	32,011
Hudson River Railroad	684,688	2,996
New Haven Railroad	621,220	3,126
Jersey Railroad	482,000	945
Ramape and Patterson Railroad ..	182,500	637
Steamboats	273,750	912
Barges	273,750	1,365
Total	16,709,456	80,938

giving a total amount for the year, equal to 33,418,912 quarts, or 182,826 quarts per day; from which it appears that the supply of country milk in 1851-2, more than quadrupled the entire supply in 1841. In 1842, the year after the opening of the Erie Railroad, the quantity of milk brought up amounted to 388,505 quarts; last year (1852), it nearly reached 13,000,000 quarts.

Thus much for country milk; but another great source of supply exists—the *swill milk* manufactories in and about the city. According to the best estimates, these furnish a supply about double that obtained from the country, being somewhere about 60,000,000 quarts per annum, or 160,000 quarts per day.

It appears also that both the country and the swill milk are adulterated by the dealers to the extent of one-fourth of the original amount; this would give us something like the following amounts for the annual consumption of New York:—

	Quarts.
Country milk brought	33,418,912
Swill milk	60,000,000
Per-centage of adulteration to country milk ..	8,000,000
Ditto to swill milk	15,000,000
Total	116,418,912

and would require an annual outlay by the consumers equal to about

$5,500,000, which, taking the population at about 600,000, would give an average of $9 16c. per head for the supply of milk, equivalent to about 204 quarts per annum, or ·56 of a quart per day per head.

Notwithstanding the cheap rate of railway carriage, and the great inducements both to suppliers and consumers to encourage that mode of supplying the market, the *swill milk trade* increases still more rapidly. The number of cows kept for the supply of country milk is estimated at 10,000, having a value of $250,000. Those kept in the city and its vicinity are estimated at 13,000, and valued at $200,000. These latter are fed almost entirely on "*swill*"—distillery wash. This is carried for 3 or 4 miles round to the outlying establishments.

The adulteration of the milk seems to be the act of the city dealers, very little taking place in the country districts; however, even the doctored and sophisticated country milk is considered far preferable to the swill milk.

The largest establishment in the city is at the end of Sixteenth Street, by the North river, which contains, in three parallel rows, from 600 to 700 feet in length, large cow stables, having altogether accommodation for nearly 2,000 cows, and extending from the Tenth Avenue down to the river. In these stables they are confined in very close order, in a heated and tainted atmosphere, and are fed upon the "*swill*," with which their feeding troughs are liberally furnished. Occasionally a small quantity of other food, as hay, meal, &c., are given. It requires about a fortnight before the animal will take to the food, after that the average consumption by each cow amounts to from 28 to 30 gallons per day, for which a charge is made of 6 cents per day per head. No litter is allowed for bedding, and the accumulation of filth is painfully evident as you approach the premises. The effect upon the health of the animal soon becomes evident; the jaws are affected, the hair falls off, and the ulcerated condition of the hoofs renders it difficult to keep it on its legs. Nevertheless, on all occasions, when practicable, it is rendered available to the slaughterer. The loss by deaths is *twelve per cent.* per annum. Another large establishment exists in Fortieth Street, where the cows are kept in a manner quite as bad as the foregoing; and in Williamsburgh, adjoining an extensive distillery, may be seen a similar establishment where the cows are forced together in a still more reprehensible manner. Here, indeed, the mortality is frightful, averaging from *sixty to sixty-five per cent. annually.*

Some very interesting specimens of the vegetable produce of the territory of Minnesota were contributed by G. W. le Duc, of St. Paul, comprising varieties of corn, wheat, barley, a large bag of "manomin" or Indian rice (*Zizania aquatica*), &c., "mococks" of maple sugar, as prepared for market by the Indians. A neatly arranged collection of grain in ear was exhibited by S. L. Thompson of Long Island. The names, however, appeared to be somewhat arbitrarily given.

Rice, one of the staple products of the Southern States, was left unrepresented save by J. Davis, of Wilmington, North Carolina, and by one lady exhibitor, Mrs. W. C. Wayne, of Wilton Bluff, Poupon river, South Carolina, who forwarded samples of the crop grown on their estates, both in the sheaf and thrashed out and husked for market.

The cultivation of rice is principally met with in the States of Georgia, South Carolina, Florida, Mississippi, Louisiana, Alabama and Texas. A variety called the Cochin China, or mountain rice (*Oriza mutica*), is grown in Virginia and Maryland, and other places north of these States. The common variety delights in low-lying, swampy districts, as tide-water swamps. The mountain rice, as its name imports, is more adapted to dry and elevated places. The former is the most productive, and furnishes the finest sample; an average crop may be taken at from 30 to 50 bushels; whereas the latter rarely yields more than from 16 to 24 bushels per acre.

The export trade shows but little increase, the returns being, for 1800, 112,056 tierces; 1810, 131,341 tierces; 1820, 88,221 tierces; 1830, 116,517 tierces; 1840, 101,617 tierces; and 1850, 105,590 tierces. The total produce of the States, however, shows a remarkable increase in the last 10 years, the crop of 1840 being estimated at 80,841,422 lbs. and the crop of 1850 at 215,312,710 lbs., contributed by the following States:—

	lbs.
Virginia	17,154
North Carolina	5,465,868
South Carolina	159,930,613
Georgia	38,950,691
Florida	1,075,090
Alabama	2,311,252
Mississippi	2,719,856
Louisiana	4,425,349
Texas	87,916
Arkansas	63,179
Tennessee	258,854
Kentucky	5,688
Missouri	700
Iowa	500
Total	215,312,710

Flint, Peabody and Co., exhibited specimens of California grain crops of gigantic proportions. The oats were *ten feet three inches high,* with heads from *twenty-two to twenty-eight inches long;* some of the wheat contained from 50 to 80 grains on each spike; others showed that the tillering process had been very vigorous.

Great Britain.—The contributions of Great Britain to Class III were very scanty, the only one needing notice was the large collection of agricultural and horticultural seeds, exhibited by Noble, Cooper, and Bolton, of London, whose value, however, was much lessened by the absence of any arrangement in the disposition of them.

Canada.—In this class the substances exhibited as the productions of Canada were both more numerous and better calculated from their quality to uphold the character the colony acquired in 1851 than those which she contributed to either of the preceding classes. Five excellent samples of wheat flour were exhibited by A. Priffier and by L. A. Cummer, of Waterdown, and by J. D. Ewart, of Dundas, C. W.; and samples of buckwheat flour by E. Trenholm, of Kensey, C. E.; samples of barley of good colour, though rather light weight, were sent by E. W. Thompson, of Toronto. Samples of maple sugar, raw and purified, in cakes, do. crystallized, were sent by Betsy Rousseau, of St. Hilaire, C. E. A case was exhibited also by — Lambley, of Quebec, containing varieties of maple sugar in various states,—the raw syrup, the sugar crystallised, and as sugar candy. A fine sample of white wheat was sent by J. B. Carpenter, of Townshend; and some remarkably fine white peas were exhibited by James Herring, of Toronto. Good samples of peas were sent also by S. Bartlett, of Belleville, C. W., and by J. Muir, of Hinchinbroke, C. E., who exhibited a very fine sample of Hopetoun oats, and a well-made and well-flavoured cheese.

There were several other samples of agricultural produce shewn, but not sufficiently good to claim a special notice.

The only other contributions to this class consisted of various sauces, and also some cigars, snuffs, &c., which were apparently of good quality.

Prince Edward's Island.—From Prince Edward's Island specimens of agricultural seeds were sent, which were remarkable for the excellence of their quality and the very clean and creditable manner in which they had been prepared for exhibition. They comprised samples of white and black oats, barley, linseed, Timothy seed, buckwheat, and red clover, besides samples of pearl barley, oatmeal, and flax fibre. Some cheese, butter, and lard, were also exhibited. These, however, had suffered from the high temperature of the building.

British Guiana.—The collection contributed to this class by British Guiana was very comprehensive and well-arranged. It comprised various samples of sugar prepared by the vacuum pan process, and also samples of the rum, both coloured and pure, manufactured at the same estates. These form important articles in the commercial produce of the colony. In 1852 the returns were—

Sugar	55,700 hhds.
Molasses	10,075 puncheons.
Rum	24,520 „

Several samples of rice and maize were sent, as also of cacao, and of coffee, and its substitute, the seeds of the cassia occidentalis. Dried pigeon peas (*Cajanus flavus*) were exhibited. The meal of the plantain, one of the most important of the vegetable productions of the country, was well represented by specimens contributed from several different estates. This meal is one of the most nutritive of the amylaceous class, owing to the amount of nitrogen compounds it contains, about 5½ per cent. (·88 N). From the bitter cassava (*Janipha manihot*) a very nutritive meal is obtained, containing ·78 N, equal to 4·83 of proteine compounds, and from the inspissated juice of the roots of the plant a powerful condiment and also antiseptic substance is obtained called "cassareep," which enters largely into the composition of their stimulant sauces. Samples of these, as also of the meal of the sweet cassava (*J. Loeflingii*), and of various arrowroots, were amongst the articles exhibited. Dried bananas and sliced and dried bread fruit (*Artocarpus incisa*), samples of tobacco, and samples of the isinglass, procured from the "gilbacker" (*Silurus Parkeri*), a fish very abundant in the estuaries of the colony, formed some of the more prominent portions of the collection.

Newfoundland.—Some good barley was exhibited by the Newfoundland Agricultural Society. Cod-liver oil, fine quality, by L. J. Dearen, of St. John's, some very good preserved fish, in hermetically-sealed cases, and samples of raspberry-vinegar.

Bermuda.—From Bermuda, a cask of very fine arrowroot was sent by J. Dickinson.

France.—In the French department, Leroy Dubois, of Illies [du Nord], exhibited a large collection of samples of 48 varieties of wheat in the straw, all duly named.

Various preserved alimentary substances were exhibited by Gremailly, sen., of Gray, Haute Saône, consisting of meats ready-cooked; by Aug. Gillet, of Knival, Morbihan; and by B. Bassil of La Rochelle, Charante Inferieure, consisting of sardines in oil, of excellent quality. Those by Bassil and by J. Fiton, sen., of Bordeaux, were affected by the temperature, and were not in good condition. Samples of various vegetables, dessicated by Masson's process, were exhibited by Chollet and Co.; truffles, by A. and E. Pellier of Mans, Sarthe; preserved potatoes were exhibited by E Bergerel and Co., of Roanne, Loire, and a collection of preserved fruits was exhibited by Roedel and Son, of Bordeaux, all of which appeared to be of excellent quality. Chocolate, in its various preparations, was exhibited by C. Chocquart, by Perron, and by Menier and Co., all of Paris, the latter of whom exhibited also pearl and ground barley. Their cases were very neatly arranged, and liberally supplied, and the quality of the chocolate fully supported the well-known character of their respective establishments.

Zollverein.—The contributions from the States of the Zollverein were not so numerous in this Class as in Class II. Amongst those most worthy of remark were the samples of snuffs by Bernard, Brothers, of Offenbach, who exhibited a large collection; and those by Golzenleucher, Simeons, and Co., also of Offenbach, which were of very excellent quality. C. Graff, of Bingen, Hesse Darmstadt, also exhibited good specimens of tobacco and snuffs. An extensive collection of preserved provisions was exhibited by D. H. Carstens, of Lubeck, and a large and well-arranged series of chicory, in all its stages of manufacture, was exhibited by J. A. Saloman, of Brunswick. The samples of hops exhibited by Schroeder and Sandfort, of Maentz, were very good, but had lost their flavour and aroma by being exhibited loose in a bottle.

Holland.—From Holland there were but very few exhibitors in this Class, and even those were of a very unimportant character. A good series of potatoe products, including starch, dextrine, syrups, &c., and the waste substances, was exhibited by Schöneveld and Westerbaan, of Gouda. The chicory exhibited by W. Fer Horst and Co., of Lieüwarden, was of good quality and well prepared; but the alimentary preserved substances sent by N. H. A. Janssen, of Hertogenbosch, appeared to have undergone some change since they were deposited in the building.

Austria.—The only representative of this Class furnished by Austria was some samples of tobacco exhibited by J. S. Frobisch, of Pesth. It was of a small-leaf variety, with a strong and heavy midrib. The quality appeared to be good.

Italy.—In the Italian department some excellent specimens of vermicelli, maccaroni, and other similar preparations, were exhibited by Matteo Astengo, of Savona, and by G. Valdettaro, of Genoa. Their cases were neatly arranged, and all the articles were well manufactured and of good quality. Samples of olive-oil of fine quality also were exhibited in this department by several different manufacturers.

Belgium.—Belgium had only two contributors to this Class, E. van Guteruyen, of East Flanders, who sent a series of wheat starches of various qualities, suitable for manufacturing purposes; and Claus and Caron, of Ghent, who exhibited some very good samples, illustrating the process of refining sugars and of making sugar-candies. The manufactured articles were of excellent quality.

Cuba.—From Cuba excellent samples of cigars were exhibited by Matteo Saenz and Co., of Havana; by Cook and Favargen, of Havana; and by Gomez.

Castor-oil, remarkably fine quality, was sent from *Porto Rico* by J. Henna, and from *Liberia* specimens of sugar (raw), coffee, and cocoa, were contributed by Captain Lynch, U.S.N.

CLASS IV.

VEGETABLE AND ANIMAL SUBSTANCES EMPLOYED IN MANUFACTURES.*

In Class IV the United States department presented a more satisfactory aspect than that of the other countries which contributed articles of their produce to the general Exhibition. In a country possessing such a vast surface area, extending from lat. 25° to 49° N., and from long. 67° to 124° W., and including within its limits such a variety of soil and climate, it might be expected to be in the power of the several States to comprise within their respective contributions specimens of most of the substances subservient to industrial economy. This, however, was not carried to the extent that it might have been, owing, perhaps, to the character of the undertaking being particularly commercial, which caused exhibitors rather to send specimens of produce in general use than to introduce other substances which, although highly important and instructive in themselves, were not so closely allied with the various industries in which they might be severally interested. Thus cotton, the great staple produce of the States; fatty substances and their manufactures, as soap and candles; oils—animal and vegetable;—and hemp, were abundantly represented; while many of the other "vegetable and animal substances employed in manufactures" were either entirely absent or else exhibited in a manner unnecessary to be remarked upon in this Report.

The specimens of cotton exhibited were supplied chiefly by the States of Mississippi and Tennessee, and were of a quality fully to sustain their well-known character. A new variety, called the Golden Cotton, was sent by John Pope, of Memphis, and also by Samuel Bond, of Green Bottom, Tennessee;

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* The Jury awards in reference to the articles exhibited in this Class will be found in Mr. Dilke's Report, page 14.

with the former a pod-bearing branch was sent, which, if a fair specimen, would indicate the variety as a very productive one. The opinions of competent judges were pronounced strongly in favour of it. The famed "Sea Island" cotton, or "long staple," was exhibited by Wm. Seabrook, of Charleston, South Carolina, who received a Prize Medal for his cotton in 1851.

Commercially speaking, two distinct kinds of cotton are cultivated in the States: that called "long staple," "black seed," "lowland," or "Sea Island," —when raised inland, it is sometimes called "Mains;" and the "short staple," "green seed," "upland," also sometimes called "Petit Gulf," or "Mexican."*

The first generally commands a considerably higher price than the latter description, and the finest quality, "Sea Island," often brings a price very much exceeding the top market price. This cotton is prepared in a different manner to the short staple, being generally cleaned by hand or by the roller "gin" instead of the saw "gin," which is used for the short staple, but which would be injurious to the long fibre of the "Sea Island." The yield of the long staple may be taken at from 75lbs. to 150lbs. of cleaned fibre to the acre. It is put up in bags of about 300lbs. each, and the labour of one man is equal to about the production of 450lbs. of cotton. The yield of the short staple averages 150lbs. to 250lbs. to the acre, and is sent into market compressed into bales of 400lbs. to 500lbs. each; the labour required is estimated at one man to each 4 bales, equal to about 8 acres of cultivated land. The districts suitable to the growth of long staple cotton in the States are not nearly so extensive as those in which the short staple may be advantageously cultivated, and the crop of Sea Island has consequently not increased in the same proportion as the short staple; at the same time the demand for it is not so great, as its uses are more limited, being only adapted for finer goods. Its cultivation is confined to South Carolina, Georgia, and Florida. The statistical returns of the relative produce of the two varieties are very imperfect. The returns of the exports will be a sufficient guide, inasmuch as the home consumption in the States does not exceed one-hundredth part of the entire growth.

	lbs.
In 1805, 1806, 1807	23,809,752
1808	949,051
1809, 1810, 1811	25.297,867
1812, 1813, 1814	11,022.993
1815	8,449,951
1821, 1822, 1823	34.731,389
1849, 1850, 1851	28,505,378
1852	11,738,075

Of these quantities about four-fifths have been consumed in Great Britain and one-fifth in France.

The Cotton Zone may be considered as extending from the Atlantic Ocean to the Rio del Norte, and includes the States of South Carolina, Georgia, Alabama, Missisippi, Louisiana, and those portions of the States of North Carolina, Tennessee, and Arkansas, that lie below 35° north latitude, all the State of Florida above the 27th parallel of north latitude, and all the State of Tex between the Gulf of Mexico and the 34th parallel of north latitude. The region described occupies an area of upwards of 450,000 square miles, but large portions of it are mountainous or covered with water, and in each State more than two-thirds from various other causes, it has been estimated, are not adapted to the growth of cotton advantageously. The annexed table shows the estimated cotton crop of each of the States mentioned that produced cotton in 1852, the number of labourers required in its cultivation, the estimated quantity in each State of lands now appropriated to growing cotton, and the additional quantity that may be planted with it, should the demand increase, the number of hands required for such additional cultivation, and the estimated total produce.

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* There are three great varieties:—

1. Gossypium Herbaceum.
2. Gossypium Arboreum, tree cotton.
3. Gossypium Hirsutum, hairy, or shrub cotton.

The two first comprise the green seed, short staple or upland; the latter, the blackseed, long staple, or Sea Island.

	Number of Bales of 400 lbs. each.	Labourers employed.	Acres in cultivation in 1852.	Additional area suitable to cotton cultivation.	Number of Labourers needed.	Gross additional produce in Bales of 400 lbs. each.
Florida	80,000	20,000	160,000	6,000,000	750,000	3,000,000
Texas	100,000	25,000	200,000	10,000,000	1,250,000	5,000,000
Arkansas	100,000	25,000	200,000	3,000,000	375,000	1,500,000
Louisiana	200,000	50,000	400,000	3,000,000	375,000	1,500,000
Tennessee	220,000	55,000	440,000	2,000,000	250,000	1,000,000
South Carolina	310,000	77,500	620,000	200,000	25,000	100,000
Mississippi	650,000	162,500	1,300,000	6,000,000	750,000	3,000,000
Georgia	740,000	185,000	1,480,000	3,000,000	375,000	1,500,000
Alabama	750,000	187,000	1,500,000	6,000,000	750,000	3,000,000
	3,150,000	787,000	6,300,000	39,200,000	4,900,000	19,600,000

The labour is estimated at an average of one man to each four bales, and the land is estimated at 200 lbs. produce per acre, or 8 acres to each labourer.

The earliests records of the cotton exports of the United States carry us back to 1748, when it appears that 7 bags of cotton wool were shipped at Charleston, South Carolina, and invoiced at £3 11*s.* 5*d.* per bag; another small shipment followed in 1754. In 1770 a small increase is shown by the shipment of ten bales to Liverpool. In 1784 the export trade began to assume a permanent character, and in a few years showed a great increase.

	Bales.		Bales.
1784	8	1788	389
1785	14	1789	842
1786	6	1790	81
1787	109		

The prices vary much,—

	c. per lb.		c. per lb.
1791	26	1831	9
1801	44	1834	13
1811	15½	1844	16½
1821	16		

The Sea Island cotton, of which there are some twelve to fifteen varieties, is almost exclusively produced on the islands, or low-lying grounds to the distance of about thirty miles, stretching inland along the coast between Charleston and Savannah. This was first raised in Georgia in 1786, and the first bag was exported in 1788. The quantity grown in 1805 and 1832 was precisely the same.

Some curious anomalies occur in the industrial history of this description of cotton. Its quality and suitability for peculiar purposes has always rendered its cultivation an object of great importance, and both capital and skill have been brought to bear upon it to a much greater extent than upon the shortstaple varieties of cotton. In the early part of the present century, up to within the last twenty years, the leading growers appear to have been very successful in their operations, their superior skill and method of cultivation being shown by the very high prices they obtained. For instance, Mr. K. Burder, Collector of St. John's, South Carolina, in 1805, produced a superior article, which sold for 25 c. per pound more than that of any of his neighbours. In 1826 we find him selling his crop at 110 c. per lb., and the following year he again improved his price, and received no less than 125 c. per lb. for it. In 1828, another improved grower obtained for a small lot the enormous price of $2 per lb.; the highest market price at which cotton ever was sold.

The success which attended these improvements in the cultivation of the cotton, have not, however, proved in their results so beneficial to the producers as they had a right to expect they would, for not only was the improvement in the quality of the staple followed by a relative decrease in the quantity of the produce, but prices have also declined in a much greater proportion. From the time of its first introduction to within a recent date its cultivation is understood to have been very remunerative; latterly, it has declined until it barely covers the ordinary rate of interest on capital. From 1821 to 1831, the aggregate crop was 107,294,930 lbs. In the ten succeeding years it exhibited a deficit of no less than 23,253,334 lbs., the aggregate amount being only 79,041,596 lbs. The average annual produce from 1805 to 1817, a period of 9 years (excluding 4 years as affected by war), was greater by 797,033 lbs. than it has been for the 9 years ending 1851; notwithstanding the area under cultivation at present is estimated to be at least one-third greater than that in 1820, and fully double than that in 1804. "Under the operation, therefore, of decreased and decreasing exports," says Mr. Seabrook, "with a vast augmented population in all cotton consuming countries, with extraordinary improvements in machinery, and greater skill and economy in spinning and weaving, lower fiscal charges on importation, and superior quality in the article sent to market, the value of long-staple cotton is less now than it was 35 years ago."

From some cotton statistics, published in "Hunt's Merchant's Magazine," and quoted in an address by the Committee of Florida cotton planters, it is shown that the per cent. increase of production has been regularly and rapidly diminishing since the commencement of the present century. The total increase per cent. for the first 20 years may be taken at 177, or 8·85 per annum; for the next 15 years it amounted to 119, or 7·66 per annum; for the next 10 it declined to 58 or 5·95 per annum; and for the 5 years ending 1850, it reached only 15, or 3 per cent. per annum.*

By these it is seen that the per centage of increase in production of United States cotton has been declining until it has arrived at only 3 per cent. per annum; while during the same period the rate of home consumption has been gradually increasing until it has reached about 9 per cent. per annum. The per cent. increase in production of the world for the last 5 years has fallen as low as 1·8 per cent. per annum; while the gross per centage of increase in consumption has been just 3·8 per cent. per annum; and if we strike out of the list England, France, and the United States, we find the increase in the other cotton-consuming countries to amount to more than 9 per cent. per annum. The relative rates of production and consumption appear to contain matter worthy of consideration, as such a condition of things cannot long continue; either the rate of production must be increased, or the power of consumption will of necessity be diminished.

The cotton-crop receipts are subject to great variations; at one time going up for a few years, and then declining as rapidly. In twenty-five years, according to the official reports of the Secretary of the Treasury, the value of the cotton exports has six times reached the maximum and five times the minimum prices. Of these six years of high receipts three of them were large crops, two an average, and one small. Of the five years of low prices, four of them were small crops and one an average. It is a common idea with the planters that short crops insure high prices, this is somewhat disproved by the foregoing statement, as the rule held good only once in the whole eleven years.

The cost of producing cotton necessarily varies according to the soil, climate, or season, and skill employed. It appears, however, from the most reliable estimates, to average from 4·7c. to 6c. per pound; and that the nett profit upon the article to the producer may be taken at from 10 to 20 per cent. upon his capital.

TOTAL CROPS OF THE UNITED STATES FOR THE LAST 20 YEARS.

Year.	Number of Bales.	Average price of low middlings and good middlings.
		cents.
1833—34	1,205,394	..
1834—35	1,245,328	..
1835—36	1,360,725	..
1836—37	1,422,930	..
1837—38	1,801,497	..
1838—39	1,360,533	..
1839—40	2,177,835	..
1840—41	1,634,945	..
1841—42	1,683,574	..
1842—43	2,378,885	..
1843—44	2,030,409	..
1844—45	2,394,503	..
1845—46	2,100,537	6⅞ per pound.
1846—47	1,778,661	10 „
1847—48	2,347,634	6¾ „
1848—49	2,728,596	6¼ „
1849—50	2,096,706	11 „
1850—51	2,355,257	11 „
1851—52	3,015,029	8 „
1852—53	3,200,000	9 „

Some very fine samples of native wool were displayed. Those exhibited by W. J. Morgan, of Wilmington, Ohio; by Jessey P. Gillet, of Sharon, Michigan; and by John McFadden, of Harrison county, Ohio, were particularly good specimens; that from the latter was from imported stock, and appeared to have been clipped too early.

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* G. R. Porter—Paper read on "Cotton Statistics" at Edinburgh Meeting of British Association, 1850.

Some very good samples, the produce of the flock of Thomas Wood, of Ohio, were forwarded by his New York agents.

A curious sample of wool was exhibited by James Bicknell, of Aurora, New York: the growth of six years, measuring about thirty-six inches in length. Samples of wool of Cachemere goats, and of Thibet goats, bred in South Carolina, by Dr. James Davis, of Columbia, also were exhibited.

The attention of the farmers in the States has been of late years claimed by the increased demands of their woollen industry, to the importance of increasing their home supply, both as regards the quantity and quality of the raw material. Hitherto the market has been to a great extent supplied by the produce of other countries, the imports having averaged fron one-third to one-half of that produced at home.

Imported.	Quantity.	Value.
	lbs.	dollars
In the Year 1841 . .	15,006,410	1,091,953
„ 1842 . .	11,420,958	797,482
„ 1843* . .	3,517,100	245,000
„ 1844 . .	14,008,000	851,460
„ 1845 . .	23,833,040	1,689,794
„ 1846 . .	16,558,247	1,134,226
„ 1847 . .	8,460,109	555,622
„ 1848 . .	11,341,429	857,034
„ 1849 . .	17,869,022	1,177,347
„ 1850 . .	18,669,794	1,681,691

The largest proportion of this imported wool came direct from Buenos Ayres and the neighbouring States on the Rio de la Plata, and is of a coarse and cheap kind, costing from 6c. to 8c. per pound. The finer qualities are purchased chiefly in the London market, and are the produce of Australia or the German States. Large quantities of low-priced Mediterranean wools, chiefly from Mogador, Tunis, Tripoli, and Gibraltar, are likewise purchased for the American market, either through London houses, or shipped direct to the States. Cape wools are also purchased.

The home production for 1850 is given as follows:

	lbs.
Maine	1 364,034
New Hampshire	1,108,476
Vermont	3,400,717
Massachusetts	855,136
Rhode Island	129,692
Connecticut	497,454
New York	10,071,301
New Jersey	375,396
Pennsylvania	4,481,570
Delaware	57,768
Maryland	480,226
District of Columbia . . .	525
Virginia	2,860,765
North Carolina	970,738
South Carolina	487,233
Georgia	990,019
Florida	23,247
Alabama	657,118

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* Nine months only.

	lbs.
Mississippi	559,619
Louisiana	109,897
Texas	131,374
Arkansas	182,595
Tennessee	1,364,378
Kentucky	2,297,403
Ohio	10,196,371
Michigan	2,043,283
Indiana	2,610,287
Illinois	2,150,113
Missouri	1,627,164
Iowa	373,898
Wisconsin	253,963
California	5,520
Minnesota	85
Oregon	29,686
Utah Territory	9,222
New Mexico Territory	32,901
Total ..	52,789,174

In 1840 there were 19,311,374 sheep, furnishing 35,802,114 lbs. of wool, or a fleece equal to 1·84 lbs. per head. According to the returns in 1850, the number of sheep was 21,721,814, producing 52,789,174 lbs. of wool, which is equal to 2·43 lbs. per head. It would appear from these comparative statements that not only has the sheep farming of the States been successful in regard to numbers, which present a very satisfactory appearance, the increase in the decennial period amounting to about 12 per cent., but also that a great improvement had taken place in the breeds, as the average weight of the fleece has increased in the same period from 1·84 lbs. to 2·43 lbs, or about 32 per cent. In some of the States where sheep-farming is more particularly attended to, the results have been even more encouraging.

The sheep usually kept are Merinos, South Downs, Leicesters, and Cotswolds. These are, in the best districts kept pretty pure, or judiciously crossed; in others, the blood has become so mixed as to have completely obliterated the characteristics of the original breed. In Vermont, where the Rambouillet Merinos were introduced some few years back by one of their enterprising and intelligent farmers, time, money, and judgment have been freely applied to the great object of obtaining a breed combining weight and quality of fleece. His liberality and skill were speedily shown and recompensed in the success which followed; for although the gross number of sheep in that State, between 1840 and 1850, had decreased nearly one half, the wool-produce remained nearly the same. In 1840, the average weight of the fleece was 2·2 lbs.; and in 1850 it had been increased to 3·71 lbs., or nearly 70 per cent.

The original defect in the staple is still more or less observable in American wools; this, though much modified by the great care and attention bestowed of late years on the flocks, would seem to admit of still further improvement before they can take their place with first class wools. Probably the origin of the defect would be found in the irregular system of keep, the rigour of the winter climate, and the absence of nutritious root-crops, reducing the animal below the condition desirable for the healthy development of the fleece. This ought to receive attention.

In Massachusetts, where the improved system of sheep-farming has also been carried out, like satisfactory results have been obtained, although in this State sheep-farming is not carried on so extensively as in Vermont; the average weight of the fleece has been increased from 2·5 lbs. to 3·1 lbs.

The State of New York, notwithstanding a decrease in number of 1,665,000 sheep between 1840 and 1850, yet shows an increase to the amount of 226,000 lbs. in the quantity of wool produced, which shows that the average weight per fleece has increased from below 2 lbs. to about 3 lbs. each.

In the New England States in the same period there was a decrease of 1,646,855 sheep, or 45 per cent. In the five middle Atlantic States, New Jersey, New York, Philadelphia, Delaware, and Maryland, there was a decrease of from 7,402,851 to 5,641,391, equal to 1,761,460 sheep, or 22½ per cent. In the Southern and Western States there was an aggregate increase shown of

5,717,608, to which Ohio contributed no less than 1,914,528, showing an increase from 2,028,491, in 1840, to 3,942,929 in 1850, or nearly 100 per cent.

Notwithstanding the great improvement in the breed of sheep and in the production of wool, the demand of the consumer increased in a more rapid ratio, as the imports since those returns testify. In 1851 the quantity imported amounted to the enormous quantity of 32,548,693 lbs., having a value of $3,800,000; being nearly double that of the previous year.

Specimens of *hemp* were exhibited by several different persons. John G. Hunter, of Lexington, Kentucky, sent a bale of good quality and of good colour. Haliday and Dickey, and Baker, Bell, and Co., both of Weston, Missouri, sent sample bales of dew-retted hemp. The former was of good quality, though the colour was rather dark; the latter was also of good quality but rather unequally retted.

A more even sample was sent by J. H. Saunders, of Sibley, Missouri, and also by Douglass and Bur, of St. Louis; in all cases, however, the retting process seemed to have been imperfect, which would necessarily occasion a large loss on the heckles.

The home production of hemp for the last year, 1852-3 was, in round numbers, 30,000 tons; of which amount

Kentucky yielded	15,000 tons.
Missouri "	10,000 "
Other States " . . .	4,000 to 5,000 "

The Census returns for 1850 give the following details of its cultivation, &c.:—

	Dew Retted.	Water Retted.
	Tons.	Tons.
New York . . .	1	3
Pennsylvania . . .	44	..
Virginia	90	51
North Carolina . .	36	3
Mississippi . . .	7	..
Arkansas . . .	..	15
Tennessee . .	456	141
Kentucky . . .	16,432	11,956
Ohio	100	50
Indiana . . .	67	62
Illinois . . .	93	56
Missouri	15,968	60
Wisconsin . . .	..	2

Of dressed *flax* only one sample was exhibited, and that was shown in Class XIV rather to illustrate the manufacture of shoe-threads than from any value which the exhibitor attached to the raw material itself. This was a somewhat remarkable omission, inasmuch as the consumption of linen goods in the States bears a higher proportion to the population than even in this country, being at the rate of about 2 yards per head. On turning to the Census returns, too, we find that in 1849 and 1850 the quantity of flax produced amounted to no less than 7,715,961 lbs., and the quantity of flax-seed to 562,312 bushels. At this period there were 12 flax-spinning mills, containing about 15,000 spindles, in the Union, located in the States of Massachusetts, New York, New Jersey, and Pennsylvania. Since then, others have been erected. At Fall River I had an opportunity of going over the newly-erected mill of the North American Flax Company, in which all the most recent improvements in machinery had been introduced from this country, and which, as regards the building itself, and the general working arrangements, would compare successfully with the leading establishments of Leeds or Belfast. The centre building, already erected, contains 12,000 spindles, and the wings, which it is intended eventually to add, will contain the same number. This establishment, as well as most of the others, I found, was obliged to draw its supply of flax from Europe; as, notwithstanding the large amount of flax returned by the Census officers as home-produced, very little, comparatively, came to market, and that of such a low quality as to be only suitable for the coarsest yarns.

In following up the enquiry, when in the Western States, I found that the breadth of flax cultivated greatly exceeded the Government returns; which, allowing 10 bushels of seed to be the average produce of an acre, amounted to 56,231 acres only. The result of my enquiries led me to believe that at least 200,000 acres of flax were cultivated in the year 1852-53 in those Western States which I visited, Ohio, Kentucky, Illinois, Indiana, and Wisconsin, alone; and that, practically speaking, the only produce that found its way to market was the seed, the straw being entirely neglected, and either burnt on the field or carried home to rot in the yard. Of Missouri and Mississippi I could get no details, though flax is grown there to a considerable extent.

The seed, after deducting the quantity necessary for the next year's sowing, is consumed entirely by the oil mills, the oil meeting with a ready market at home, and the residuum, "oil-cake," finding its way to the Atlantic States, whence a large proportion is shipped to this country. Notwithstanding the large annual supply of seed from the home harvests, it is not sufficient to meet the market demand; as we find from the customs returns that the following amounts were imported into the States:—

In the Year	1847	198,000 bushels.
„	1848	426,000 „
„	1849	324,000 „
„	1850	405,000 „
„	1851	657,000 „

In the States I visited I was informed that the straw could be purchased in any quantities at a price varying from 10 York shillings (about \$1¼) to \$2 a ton on the field. Calculating the straw-produce to average 1 ton per acre, it would thus appear that 200,000 tons, capable of yielding by the improved processes one-eighth of its weight, or 25,000 tons of dressed fibre, are entirely lost to the home market, which is obliged to seek its supply from other countries.

This estimate, though differing so largely from the official returns, has been confirmed by a gentleman prominently connected with the flax interest of the States, who has quite recently been over the same ground, and likewise through the States of Missouri and Mississippi, whose production, he informed me, would considerably add to the general estimate I have given. At the invitation of the New York State Agricultural Society, I had an opportunity, at the annual fair held at Saratoga, of making known the methods of flax cultivation and preparation adopted in Europe, and of calling attention to its present condition and industrial importance in the United States. The subject has not been allowed to remain unnoticed, and has excited considerable interest among the agriculturists of the Western States, and also of the State of New York. The "State Agricultural Journal," of February last, contains "some considerations relative to the importance of flax cultivation in the State." It appears from these that about 8,000 acres of flax are grown in the State; of these, about 5,000 acres are in Washington and Rensselaer counties, and the remaining portion are situate in Herkimer, Lewis, Jefferson, Seneca, Cayuga, Oneida, Otsego, Erie, Cortland, and Chenango counties. Evidence is adduced to show that the crop is not more exhausting than the ordinary grain crops; and the money advantage it offers to the grower is given in the following statement of expenditure and returns per acre:—

		$ c.
Dr.	1 Bushel of Seed	1 50
	Getting in crop	2 50
	Use of land	6 00
	Pulling crop	3 50
	Cleaning seed-retting and marketing	4 00
		17 50
Cr.	1 Ton of Straw	16 00
	12 Bushels of seed at 11*s*.	16 50
		32 50

In giving this statement it is admitted that much larger crops are grown than the one estimated, but it is believed that the crop referred to and the return from it will pay the farmer for its cultivation; and that whatever more may be obtained from superior culture will add to his profits, and thus render the crop a still more advantageous one. After some details as to the most advantageous methods of cultivation and preparation, a recommendation is made to the Executive Committee to offer premiums for the cultivation of flax of not less than 5 acres in extent, requiring a full statement of the manner of culture and all the expenses attending it.

Flax appears to offer some special points of great importance to the industry of the States, not only as regards the development of their own natural resources, but as a powerful agent in strengthening the commercial relations between that country and our own.

America is a large consumer of flax manufactures in their various shapes, which she imports, chiefly from this country, to the amount of between $20,000,000 and $25,000,000 per annum, while it appears that her own soil produces an amount of the raw material equal, under proper management, to furnish the means for meeting this consumption. At the same time, the manufacture of flax goods in this country has considerably outstripped the home production of the raw material, of which we are necessitated to obtain large supplies from other countries. Thus we purchase the raw material from one country, pass it through our manufacturing processes, and then export the finished produce to the markets of another country, which country itself is capable of furnishing us with a supply of the raw material, fully equivalent to its consumption, in the manufactured state.

The magnitude of the operation renders this a question of no small consideration, when we recollect that the States take about $20,000,000 of flax manufactures from this country, and that we had to import last year (1852-53) no less a quantity than 1,194,184 cwt. of dressed flax-fibre, and 1,301,488 cwt. of hemp to supply our own manufacturing requirements.* The present state of our commercial relations with the North of Europe, whence we draw the largest amount of the raw material, renders it most desirable both for us, as manufacturers, and for the United States, as large consumers, that the relative importance of this question to the two countries should be clearly understood.

Potato starch, of good colour and quality, used extensively for manufacturing purposes, was exhibited by Lockwood and Orvis, of Troy, New York, and by Mixer and Gilbert, of Boston, Massachusetts.

Extract of logwood and other dye-woods, very well prepared, were exhibited by Russell, Styles, and Hubbard, of Yonkers, New York.

Some large logs of the wild native vine-trees, 10 inches in diameter, and of sassafras (*Laurus sassafras*), 26 inches in diameter, were sent by W. S. Moseley, of New Madrid, Missouri.

A case containing a good collection of varnishes and shell-lac, bleached and unbleached, was exhibited by Zinssner and Marx, of New York.

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* From returns recently quoted in "The Times" the quantity of flax imported in the past year, 1853-4, amounted to 94,169 tons, of which all, save 29,770 tons, was Russian. The quantity of hemp imported during the same period was 63,142 tons, of which Russia supplied 41,819 tons. The total *ordinary* value of these imports might be taken at £3,395,635; their market value, under existing circumstances, has risen to £6,500,000.

Samples of bee's-wax, both yellow and white, were sent by Arthur Nix, of New York, the latter not very well bleached.

Lard-oil and *stearine* are so identified with a branch of productive industry peculiar to the United States that more than a passing remark may be permitted. This industry appears to have originated in, and indeed is still confined to the Western States, where the natural luxuriance of the soil yielded a return far greater than sufficed the wants of its occupiers. Situated at a vast distance from the populous centres of commerce and manufactures, and being beyond the range of demand for foreign markets, owing to the then undeveloped system of railroads and water communication, the early occupiers of the soil, with a ready perception of the difficulties of their situation, and their remedy, resolved to breed hogs on a scale sufficient to enable them to convert their corn into living flesh, and thus travel it at a low cost to far distant markets. It is now some 25 to 30 years ago since this new system of farming commenced, and in the course of a few years it assumed the character of a distinct and promising industry. Cincinnati, then (1830) numbering about 25,000 inhabitants, and being the business centre of an immense corn-growing and hog-rearing district, and the most important rising city of the West, at once became the seat of the new trade. Now the "Queen City of the West" numbers upwards of 150,000 inhabitants,—an increase of population largely due to the success of this new industry.

As it possesses some peculiar features in relation to agriculture, a brief sketch of it from the farm to the factory may not be without interest. The hogs are kept in numbers, great or small, according to the circumstances of the case, either as regards the possessions of the owner or the proximity of markets, at which he could in the ordinary manner dispose of his corn. They are usually allowed to run in the woods, and to seek their food on acorns, beech-masts, grass, &c., until the end of August or the beginning of September, when those intended for slaughtering are turned into the corn-fields, where they remain eating and fattening until the end of October, when they are collected and sent up to market. In cases where small lots only are kept, they are usually purchased by drovers or jobbers, who again dispose of them to the large dealers; in other cases, the farmer drives them to market himself, and deals directly with the consumer. Some of the more extensive farmers will have as many as from 800 to 1,000 hogs, but from 100 to 500 is the more common average.

The age at which they are sent to market varies from 12 to 18 months, the average weight is about 200 lbs. The breeding appears to be less attended to than it deserves, some specimens are to be met with possessing those points which in this country are esteemed desirable, while the generality are very deficient in them. The season for slaughtering and packing begins in November and ends in March.

The following table shows the relative numbers slaughtered annually in Cincinnati alone, from 1830 to the present time:—

In the Year	1830	60,000
„	1835	162,000
„	1840	95,000
„	1845	213,000
„	1850	401,000

This large number gives full employment to 10 slaughter-houses and about 35 establishments for curing and packing the salted provisions.

The entire operation of slaughtering and preparing the dead meat for market is conducted upon a system and a scale of magnitude with which we are totally unacquainted in this country. Each of these slaughter-houses employs about 100 hands, selected for skill, activity, and bodily strength; the packing and preparing-houses give employment to about 2,500 hands also. In the best arranged slaughter-houses the hog-pens are placed at the uppermost story, which is approached by an inclined plane from the outside, up which the animals are driven. On the next floor beneath is the killing-room, into which they are packed as closely as possible, and a man walking over their backs strikes them on their heads with a small pole-axe contrived for the purpose. They are then dragged out immediately into the sticking-room, where their throats are cut, and their blood collected either in tanks or receivers below, or run away direct into the river. Adjoining the sticking-room are the scalding tanks, which are of large capacity and heated by steam. In these the hogs are immersed, and when sufficiently scalded, are tossed upon a cradle on to long benches, where they are vigorously attacked by a gang of men, who speedily detach the outer cuticle with every particle of the hair and dirt. They are then lowered to another floor and suspended by the hind legs on hooks ready for the last process, that of disembowelling, or gutting, as it is termed. This operation is rapidly performed, a good hand finishing them off at the rate of three per minute. The entrails are all preserved for "rendering."

In this state the carcase leaves the slaughter-house, and passes on to the packers, whose first operation is to weigh it, and thus determine its price. It is then cut up into the various divisions suitable for the trade with a rapidity and exactness quite astonishing, and which can only be acquired by great practice. As a specimen of the amazing activity which characterizes all the details of cutting, dressing, &c., it may be stated, that in one of the leading packing houses two hands in less than 13 hours cut up 850 hogs, averaging 200 lbs. weight each; two other men lifting them on to the blocks for them. All these hogs were weighed singly on the scales in the course of 11 hours. Another hand trimmed the hams, 1,700 in number, as fast as they were cut off the carcase. The hogs were thus cut up and disposed of at the rate of more than one per minute.

The hams and shoulders are salted and cured in the usual manner, and form a very large and important article of commerce both in the home and foreign markets. The middle pieces are salted as pork, and are chiefly intended for the Naval and Commercial Marine Service, considerable quantities being also exported for the supply of foreign navies. The heads, the trimmings, and the leaf-lard, are laid aside and sold for manufacturing purposes, which will be described hereafter.

Such is a brief sketch of the method adopted in Cincinnati of working up the great hog crop of that portion of the United States. The practice pursued in other districts is very similar, though not upon the same commercial scale. The number of hogs slaughtered in Cincinnati in 1850-1 was 401,755, or about 80 per cent. of the whole amount of the State of Ohio, which was given at 563,645. By recent returns for 1851-2-3 we find the gross amount of the eight principal producing States to be as follows. There are many other districts in the West from which no returns have been received, but they will not add much to the list.

	Year 1851–52.	Year 1852–53.
Ohio	547,373	603,152
Indiana	447,352	590,945
Kentucky	205,600	338,300
Tennessee	10,000	36,500
Illinois	232,519	324,856
Iowa	40,500	52,652
Missouri	69,436	87,200
Michigan	10,800	10,400
	1,562,580	2,044,005
		1,562,580
	Increase	481,452

Thus a very large increase is shown over the business of last year, but this excess was reduced somewhat by a falling off in the weight of the animals. This was noticed more particularly in the large markets, in the smaller ones the deficiency was not so marked. The reason assigned for it was that in many instances large contracts were filled by the delivery of small hogs, and then towards the close of the season, prices continuing high, a considerable number of hogs that would under ordinary circumstances have been kept on for another season, were sent into the market. It was found, therefore, that while in some instances the weights fell off from 12 to 15 per cent., in others there was no decrease, but by running all together and calculating the average, the decrease was found to be about 10 lbs. on each hog, or equal to about 5 per cent. of the weight.

In order to show the actual relative amount of the crop in both seasons as clearly as possible, let us reduce it at once into weight, estimating the average weight per hog of season 1851-1852 at 208 lbs., and that of 1852-3 at a reduction of 10 lbs., or equal to 198 lbs., the difference between the two gross amounts will then give us the actual increase.

Crop of 1851–52 ..	1,562,580	..	325,016,640 lbs.
„ 1852–53 ..	2,044,005	..	404,712,990 „
Increase in Number	481,425	.. In weight	79,699,350 „

These amounts show an increase of about 24 per cent. over the season of 1851-2, when the crop exhibited a deficiency of about 6 per cent. as compared with that of the preceding season. The following statement of the average weekly prices per 100 lbs. for the last four seasons, shows the great advance which has taken place in the price of hogs, due to the extraordinary development of this new branch of trade.

Week ending	1849–50	1850–51	1851–52	1852–53
	$ c.	$ c.	$ c.	$ c.
November 17	2 75	..	..	5 37
„ 24	2 70	3 62	..	6 00
December 1	2 72½	4 00	4 52	6 25
„ 8	2 86	3 89	4 53	6 35
„ 15	2 84	3 93	4 55	6 55
„ 22	3 94	4 10	4 69	6 78
„ 29	3 07	4 08	4 85	6 78
January 7	3 32	4 09	4 87	6 49
„ 15	3 30	4 22	4 22	6 25
	2 91	4 00	4 70	6 31

We must now turn to the other portions of the hog, those used in the various manufacturing processes. These comprise, 1st, the cuttings or trimmings; 2nd, the heads; 3rd, the entrails; 4th, the fat; and 5th, the bristles. The two first are submitted to a process of digestion termed "rendering," in steam tanks by which all the fatty matter is speedily extracted. This is sold for various purposes, according to its quality; the remaining portions being sold to prussiate of potass and animal charcoal manufacturers.

Some of these steaming or rendering establishments are upon a very large scale: not only are the ordinary refuse portions here operated upon, but large quantities of the cut meat which has got spoilt in the curing houses, entire hogs that have been bruised or injured in any way thus, and are not suited to the packer's purpose, are all thrown in together. Indeed, in many cases, where the relative prices of the two products, flesh and lard, are in such a state as to affect the market, it is found advantageous merely to retain the hams, and to sacrifice the rest of the carcase for the sake of the lard, which is extracted from it. In one of these establishments, as many as 36,000 hogs have passed through the steaming tanks in one season, or at the rate of about 400 per day, the produce in lard amounting to nearly 3,000,000 lbs.; a large proportion of which was of the "number one" quality. The steam employed has a pressure of from 50 to 75 lbs. to the square inch. As regards the 3rd portion, the leaf-lard is first cut out, the entrails are then washed, and the lard drawn out by handling; the small gut is reserved for sausage casings, and the larger boiled down for soap-grease, or other coarse purposes.

For manufacturing purposes there are three qualities of lard—leaf, gut, and head;—in the markets for export and home consumption, it is sold in two shapes, as keg lard, and as prime barrelled lard. In the latter shape it is used extensively in the States for cooking, as a substitute for butter, and exported for the same purpose to the Havannah. It is also sent in large quantities to our markets, and those on the Continent, where it is used both for culinary and trade purposes.

The relative prices of lard and meat have ruled high during the past season (1853), owing principally to the per-centage of lard in hogs having decreased from seven to ten per cent.

	Keg lard.	Prime barrelled lard.	Hams.	Bacon sides.	Bacon shoulders.
March	9¼	9	9¼	7½	6¼
April	9½	9	8¾	7½	6
May	10½	9½	9¾	7¼	6
June	10½	9½	9¼	6¾	5¼
July	10½	9½	9½	6½	6
August	10¾	10	9½	6⅜	6

The portion of the lard not sold for direct consumption as an article of food, finds a ready sale for manufacturing purposes. The most important of these is the separation of its constituent parts, the oil and the stearine: the one used largely in the adulteration of finer oils and for soap-making; the other being the substance from which candles are extensively manufactured. This separation is effected by simple pressure. The lard is placed in quantities of about 7 lbs. in coarse cotton or hair cloths, and then submitted to pressure in the ordinary way. The oil is squeezed out and runs down into suitable vessels, and the stearine remains in the form of a clear white solid cake. The best quality of lard yields the finest oil, and also the largest quantity, amounting to from 65 to 70 per cent. The second quality yields only from 40 to 50 per cent. The oil pressing is usually carried on in the winter, as the separation is more perfect at a low temperature; all the best lards are then used. In the summer, the second qualities only are used, and even then the temperature of the press-room is lowered by artificial means. The oil is submitted to a subsequent process of refining, in which it is heated up to 200°, and about one per cent. of alcohol added to assist its fluidity. There are upwards of thirty lard-oil manufactories in Cincinnati, on a scale of more or less importance, the larger ones working up on the average 50 to 70 tons of lard per month.

A fact worthy of notice in reference to this industry is, that while the receipts of the raw material have increased, the exports have diminished. This is an indication of the extended home consumption by manufacturers. The total production of last year, 1852-3, was 22,180,750 lbs.; exports during the year, 13,462,900 lbs.; leaving a balance for consumption of 8,720,000 lbs. In the year 1851-2 the gross production was 21,243,000 lbs.; the exports amounted to 15,364,000 lbs., leaving for home consumption, 5,879,000 lbs. This gives an increase in the consumption of the year 1852-3 of 2,841,000 lbs. In the manufactured products, lard-oil, stearine, candles, and soap, like satisfactory results may be gleaned from the trade returns. In lard-oil, the price of which averaged from 80c. to 85c., an increase over last year is shown in the exports of 6,760 barrels. In candles an increase is shown of 18,072 boxes, and in soap of 9,003 boxes. In neither of the latter manufactures were there any points worthy of particular notice; the processes employed were the same as those used in this country, upon a very much larger scale.

The portions of hoof and bristles of the hog are utilized to a certain extent. From the former, glue is extracted upon a small scale, and the bristles give employment to about 100 workmen in dressing and assorting them for the Atlantic markets.

In addition to this extensive industry in hog produce a very large trade is done in beef provisions, which is generally carried on by the same houses. As many as 3,000 beasts have been slaughtered by one house in the course of the season. The prices for beef have ruled high during the past season, owing to the comparatively limited supply from the West, whence the markets are almost entirely furnished. By the recent annual return of the Board of Commerce of Cincinnati, the price from September to January was from $5 to $6 per 100 lbs., and since that time from $6 50c. to $7 50c. has been the range, with occasional sales for prime quality in April and May at $8. These figures indicate the current rate for good cattle only, ordinary and inferior descriptions having ruled from $1 to $3 lower.

This department of the provision trade exhibits also a very satisfactory condition, its increase having been regular and large, notwithstanding the rise of price in the markets. The exports for the last five years from Cincinnati are as follows:—

	1848-9.	1849-50.	1850-1.	1851-2.	1852-3.
Beef in barrels ..	12,523	17,758	19,937	20,015	26,982
„ „	9,332	6,625	9,356	9,023	17,315
Number of hides	7,731	11,225	12,459	31,775	36,242
Weight	75,028	62,865	48,079	142,823	28,449

A sample of *resin oil,* a product comparatively new as regards its manufacture on a commercial scale, was exhibited by A. Miller and Co. of Newborn, North Carolina. This is obtained from the resin of the *Pinus sylvestris,* a tree found abundantly growing in the vast swamps of North Carolina. The usual process of distillation at a low temperature is first resorted to, by which the turpentine is obtained, and the residue is the common resin of commerce; from this the resin-oil is now manufactured on a very extensive scale, four establishments being in operation in New York, Philadelphia, and Delaware, averaging together 120 barrels per day, with an increasing demand. Through the courtesy of the President of the American Resin-Oil Company, I had an opportunity of seeing their works in operation. The process of manufacture was as follows: The resin used was the yellow, second quality, costing from $1 55c. to $1 75c. per barrel of 320 lbs. gross weight. This was thrown into stills, having a capacity of from 30 to 40 barrels each, and being heated by a small fire, just sufficient to melt the resin, which was gradually added. After a certain interval (a few hours) the head of the still is luted on and the fire increased; distillation then commences. A small quantity of water mixed with an acid comes over first; this is succeeded by a proportion of naphtha, and lastly the oil itself comes over, leaving behind in the bottom of the still a black pitch-like residue, which is withdrawn by the plug-holes. The whole operation requires about fourteen hours for fine qualities of oil; if it is forced on faster the quality is deteriorated. The average produce per barrel of resin, 300 lbs. net weight, is thus made up: water and acid, 2 gallons; impure naphtha, 5 gallons; resin oil, 16 to 18 gallons; pitch, 2 to 3 gallons. The water and acid are not utilized. The naphtha sells readily at 18c. per gallon, for burning and manufacturing purposes. The oil sells for 35c. per gallon for first quality, and 23c. to 30c. per gallon for second quality. The best is used extensively for dressing wools, &c., and for adulterating finer oils; the second quality for adulterating cheaper oils, for tanners, curriers, &c., and in combination with a small proportion of fatty oils it forms a capital lubricant for railway and general machinery purposes. The pitch is used chiefly for ship-work, and for outside-work, and is sold at $1 60c. per barrel. The oil requires re-distilling once or twice, according to quality. This is done in common stills, into which a jet of steam is thrown during the process. After the last distillation it is carried over into large open iron tanks, and there mixed with half its quantity of water; heat is applied, and their contents are allowed to boil until all the water is evaporated. This is called bleaching it, or rendering it fixed.

Great Britain.—This department contained but few exhibitors in this class. A very excellent collection of natural and prepared dye substances was sent by Burton and Garraway, of Bethnal Green, who exhibited also specimens of silks, wools, and leather, dyed by the different substances. A similar case was exhibited by John Marshall, of Leeds, containing specimens of indigo, archil, cudbear, and other dye stuffs, with samples of tests of chemical colours. Some well-prepared gelatine, in various forms, sheets, &c., was exhibited by J. Maine, Union-court, London; by W. Dufauville, of Islington; and by G. M. Glass, of Walworth, each of whose cases were very neatly and tastefully arranged.

In the *Canadian* department some excellent samples of glue, very hard and clear, were exhibited by A. McFarlane of Montreal. Samples of whale, dogfish, seal, and porpoise oils were sent by C. H. Tetu, of Rivière Ouelle, near Quebec; and linseed oil, of good quality, both raw and boiled, was exhibited by W. Lyman and Co., of Montreal. A fine bold sample (not well cleaned) of the seed of *Camelina sativa* was sent by James Fisher, of Rivière des Prairies, C.E. Samples of flax seed, and of dressed fibre, were exhibited by M. Picquet, of Quebec. Samples of grass straw (*Aira*), in its natural state, and bleached to imitate Tuscan straw for bonnet making, were exhibited by Madame Couture, of St. Ambroise, C. E.; and a fine specimen of pine timber, in the shape of a plank of large dimensions, being 12 feet long by 38½ inches wide, was sent by W. Parker, of Huntersville, C. E.

Newfoundland sent samples of various oils, the produce of her fisheries. Seal oil was contributed by J. and W. Stewart, of St. John's; codfish oil, by Walter Dillon, of St. John's; and other samples by L. J. Dearen, also of St. John's.

From *Prince Edward's Island* various skins were sent, extremely soft, and well prepared; and from *Bermuda* specimens of cedar wood, in the log and manufactured into boxes, were contributed by J. W. Jackson.

The contribution of *British Guiana* to this class afforded one of the most complete and best assorted series in the building. The collection contained specimens of all the principal vegetable and animal products of the colony, which were named and their applications given in a very useful and instructive manner. Amongst those most worthy of special notice were the fibres from the plantain tree (*Musa paradaisica*), obtained at different growths of the plant; the samples of ochro fibre (probably an *hybiscus*); the fibres of the agave Americana; of the banana (*Musa sapientum*); of the ita or marita palm (*Mauritia flexuosa*); and of the mahoc (*Hybiscus elatus*). Samples of cotton were exhibited, as also of the wild cotton (*Asclepias curassavica*), and of the silk grass (*Bromelia*).

In reference to the plantain fibre, some information was contributed by two of the exhibitors, Mr. Blair of Inver Island, and Mr. A. D. Vander Gon Netscher, which I have availed myself of, as in the present state of our supply of fibrous substances it is desirable to make known as much as possible the advantages offered by the cultivation of the plantain. Mr. Blair says, "The trees were passed through the iron rollers of a sugar-mill, and dried in the sun. As they were not spread out immediately after being crushed, they became somewhat injured by mildew. The plantain is an annual herbaceous tree, and averages about 30 inches in circumference and 10 feet in height. It consists of about 90 per cent. of water, containing salts and tannin in solution. All its solid parts are contained in the specimens sent, consisting of the fibre and connecting cellular tissue. The yield in this fibre of thousands of acres is lost annually in this colony alone, for want of a simple and inexpensive machine for separating it. The tree must always be cut down to obtain the fruit, and the entire stem, containing the fibre, is allowed to rot on the ground. Could an efficient and cheap machine be invented, the fibre would be almost entirely profit to the planter. The banana yields less fibre than the plantain, and its fibre is generally tinted.

Mr. Netscher gives the results of ten years' experience of a cultivation of from 400 to 480 acres in plantains, which shows that,—

1st. On a well-cultivated plantation every acre will give 300 good and 50 inferior bunches of plantains per annum.

2nd. On every acre from 700 to 200 stems are cut per annum, either for the fruit, or after having been blown down by high winds, disease, or other reasons.

3rd. On every acre but 400 suckers are planted in squares of 12×9 ft.; closer planting having proved to be injurious to the growth of the fruit and the development of the stem.

4th. Of the suckers planted, but 75 out of the 100 succeed; but once taking will give on an average 5 good offsprings in two years.

5th. The planting of the suckers at a distance of 8×8 ft. never having been tried, I am of opinion that cutting them down every eight months for the stems alone would give from 1,400 to 1,500 good stems every cutting, or 4,500 every two years. The cutting down the half-grown trees would force more sprouts to grown than is the case allowing the tree to come to perfection.

6th. The keeping up of a plantain-estate costs (on a large cultivation) $30 per acre per annum, supposing the estate to be already in good order.

7th. On plantation Klein Pouderoyen (Mr. Netscher's estate), after repeated trials the plantain-trees have given 2½ lbs. of clean, and 1½ lbs. of discoloured and broken fibre, only fit for coarse paper, per acre. This, however, was by very imperfect machinery.

8th. The average weight of the plaintain-tree is 80 lbs.

9th. The trees can be transported from the field to the building at $1 per hundred.

Various drugs, the produce of the colony, as turmeric, arnatto, &c., were sent; and specimens of other productions entering into commercial exports, as soap-berries (*Sapindus saponarius*) and Job's tears (*Coix lacryma*), the seeds of which are used for beads and other small ornaments; and Indian shot—the seeds of an undetermined species of "*canna*," extremely hard, and used by the Indians as shot. From the rhizomes of this plant is obtained the "tous les mois" starch of commerce. A very good series of the tanning barks used by the natives was sent; and a very large and well-assorted collection of the native woods of the colony, suitable for building and for marine purposes, formed a prominent feature in the department. These, upwards of 130 in number, were all named, and accompanied by useful technical information.

France.—The contributions from France were not very numerous; some, however, added much to the interest of this class. Various specimens of varnishes for leathers, woods, metals, and for water and oil painting, were exhibited by Soehnée, Brothers, of Paris. A good collection of dye-woods, with their liquid extracts, prepared for dying purposes, was exhibited by Michel, of Puteaux (Seine). A case containing an excellent assortment of flock colours, of various tints, was exhibited by Burgh and Rodel. A fleece of the Mauchamp merino wool was sent by M. Graux, of Berry-au-Bac (Aisne): this was esteemed so highly by the Jury in 1851, as to obtain for the exhibitor their highest reward, the Council Medal (see Jury Report, Class IV). The prepared hair or fur from hares and rabbits, used extensively in the hat trade, was exhibited by C. Boulat, junior, of Paris. Samples of silk were sent by several exhibitors:—those sent by Bonneton, of St. Vallier (Drôme), were accompanied by specimens of coccoons, of a very large size.

Belgium.—From Belgium, specimens of bristles, horse and cow-hair, and aloe fibre, used as stuffing for furniture purposes, were exhibited by Benoit and Haussens-Hap, of Vilvorde. The substances were also shown in their manufactured state, as brushes, cloths, &c. A. Boury, of Liége, contributed samples of cow-hair, in the raw and in the manufactured state. The goods seemed strong, &c.

Holland.—In the Holland department some curious samples of skins and hair of different animals were shown, both in a raw and in a manufactured state. L. J. Prins (widow), of Arnhem, exhibited samples of cow-hair, and also rugs and carpets woven from the same;—well made, cheap, and apparently very durable articles. Specimens of dogs'-hair, and yarns woven from it, were exhibited by T. van Berkhout, of Herman. Cat-skins, fine, well-dressed skins, dressed swan and geese skins, were exhibited by P. S. Catz and Co., of Amsterdam. A large collection of samples of horsehair, woven in various patterns, more than 100 in number, suitable for upholstery, as chairs, sofas, &c., were exhibited by P. S. Catz, and by H. Dyksman, of Rotterdam; and the same material, woven into the shape of thick bagging, and adapted for oil-pressers' use, was exhibited by P. de Wilde, junior, of Zaandam. Excellent samples of flax were contributed from South Holland, Zealand, and Friesland, by J. P. van Catz, of Gouda; and nineteen other samples, of various qualities, were sent by A. Ellerman, of Rotterdam. Some large samples of madders, and an assortment of other vegetable dye substances, principally Java indigo, madder, &c., were exhibited by J. J. Vandenbosch, of Wilhelminadorp, near Goes, and by W. and C. Voute, of Amsterdam. A case of small samples of colours, varnishes, &c., was sent by J. H. Noortveen, of Leyden, very neatly arranged. Potato-starch, sweet and of good colour, was exhibited by E. de Jager, and by J. Sturman, junior, both of Zandyk. Glue was exhibited by several: that by Vandenbergh and Co., of Zutphen, was clear, hard, and of excellent quality. An excellent display of stearine, stearic acid, and manufactured fatty compounds, in the shape of soaps, both plain and fancy;—candles and tapers of all sizes, and suitable for churches and private consumption,—were exhibited by N. Persalaer and Son, of Maestricht, and by N. D. Brandon, of Amsterdam. Both collections indicated an advanced condition of manufacture.

Zollverein.—In the Zollverein department, C. Roemer, of Brüht, Baden, exhibited samples of oil, both crude and refined, obtained from bones and other animal substances, which was stated to be less affected by very low temperatures than any other oils. Samples of fine oil (resin oil) were exhibited by G. C. Fabian, of Humboldtsau, near Breslau. P. J. Schramm, of Neuss-on-Rhine, exhibited good specimens of wheat-starch, suitable for dressing fine linen goods. Samples of dyes and colouring substances, carmine, indigo, archil, &c., all of remarkably fine quality, were exhibited by R. Knosp, of Stuttgart. Flax fibre, of excellent quality was exhibited by Ellen Von Sennewald, of Weimar, and flax water-pipes and buckets, woven without a seam, with a variety of other similar manufactures from flax, were exhibited by Burbach, Brothers, of Gotha, Saxe Gotha. Specimens of pine-needle wool, used in upholstery for stuffing, and also blankets made from the same, were exhibited (name unknown). Some fine staple merino wool was sent by Councillor Ellsner, of Breslau; a collection of merino fleeces, of fine quality and well shown, were contributed by Count Joseph Wartenberg, Prince Lichnowsky, Count Hoverden, M. Treutler, and Count Magnus.

The contributions from *Austria* were but few and unimportant. Samples of bristles were exhibited by F. G. Raffelsperger, of Vienna; raw silks of good quality were sent by G. B. Mattinzzi, of Varino, and by P. Sozzi, of Bergamo, Lombardy; and some very large-sized specimens of amadou, both prepared as medicated clothing and unprepared, were exhibited by A. Bachrick, of Vienna.

In the *Italian* department various specimens of the Tribolo or Piedmontese heath sprigs, used in the manufacture of brushes and brooms, were exhibited by G. Montu and Co., of Turin. Excellent specimens of silk (organzine), from the Protestant valleys of Piedmont, were exhibited by Genicould, Brothers, of Turin, and others suited for different fabrics were sent by Sinagaglia, Brothers, of Busca, Sardinia. Stearine and stearic acid candles, hard and of good colour, were exhibited by Lanza, Brothers, of Turin.

From *Hayti* some curious specimens of fibrous barks were exhibited by order of the Emperor Faustus the First, of which, however, no account could be obtained save that some were the bark of the pimento, the lace-wood, and of a palm. Samples of wax were also, exhibited, both yellow and bleached.

LEATHER.—(CLASS XVI.)

In connection with this class ("animal substances used in manufactures"), I have taken leather, which, however, was not very liberally represented in the building. Some of the articles exhibited were very good specimens of the present state of the trade in the four Atlantic States, New York, New Jersey, Pennsylvania, and Massachusetts, which contributed to this department.

Some samples of calf-skin, in a finished and unfinished state, of good quality, were exhibited by H. M. Crawford, of Philadelphia. Specimens of oak-tanned sole-leather was sent by Jacob Hoffmann, of East Waterford, Pennsylvania. The quality of these was very superior to that usually sent out; the closeness of the grain, firmness, and colour, showing that the materials had been good, and full time allowed for the tanning process. Another Pennsylvanian tanner, James Clewer, of Tannerville, exhibited specimens of his oak-tanned leather for belting and soles. These, probably, were the finest samples in the building, and like the last-mentioned could only have been obtained by submitting choice and sound hides to a lengthened process in the pits.

Some fancy leathers, enamelled and coloured, suitable for carriage and harness purposes, hat-making, &c., were exhibited by J. Chadwick and Co., of Newark, New Jersey, where an extensive trade is carried on in this description of goods. A somewhat remarkable hide was sent by this firm, containing no less than 100 square feet of leather, and of very fair quality.

Specimens of Morocco leather, of various colours, were exhibited by E. A. Smith, of New York. These were prepared in that city, and appeared to be very good specimens of this new branch of the tanning-trade.

The leather-trade is one of considerable importance in the States, and is spread far and wide throughout the Union. The process of tanning is carried on much in the same way as with us, save that, owing to their natural supply of tanning materials being so abundant, they rarely make use of any foreign ingredients to assist the process, though at the same time their limited capital induces them to hurry forward the operation, so as to get a return for their money as speedily as possible. In the North-Eastern States, hemlock bark (*Abies Canadensis*) is almost exclusively used; a small proportion of oak bark being used just to finish off the goods and to give them the desired colour. In the South-Western States, where the oak is met with growing freely, tanneries are met with in great numbers, and large quantities of excellent leather, adapted for heavy goods, as sole and belting purposes, are made and sent down regularly to the markets of Baltimore and Philadelphia, where, from its known quality, it always commands a higher price than that obtained for Northern leather.

Some interest was excited by the exhibition of specimens of various skins, tanned by a new process, invented and patented by David Kennedy, of Reading, Pennsylvania, in which some chemical substances are used as substitutes for bark. The articles, with one or two exceptions, appeared well prepared, but I could not obtain any information as to the particular substances employed. It was stated that, with the exception of heavy goods, no bark at all was necessary, and with them only a proportion, not exceeding one-fourth that ordinarily employed; that a great saving in time was effected; a firmer, more pliable, and more regular texture was secured; and less labour and a less expensive plant were required for the business.

In Cincinnati a considerable trade is done in tanning sheep-skins for book-binding. Here oak-bark is alone used, and the operation is speedily carried out by a process of gravitation, in which the skins are carefully sewed up, then turned inside out and filled with the tan liquor, and finally suspended in rows. About 3lbs. of ground bark is sufficient for each skin, and the whole operation is effected in about 24 hours. The stitching was done at 15 cents per dozen. From 200,000 to 250,000 skins per annum were tanned in this way in the city and suburbs.

The following statistics of the tanning establishments in the United States, according to the official returns for 1850, will give some idea of the extent and importance of the industry:—

	No. of Establishments.	No. of Hides.	Capital Invested.
			$
Maine	213	316,334	732,747
New Hampshire	163	166,579	441,975
Vermont ..	152	125,052	346,250
Massachusetts ..	246	750,220	1,377,725
Rhode Island ..	10	10,571	42,900
Connecticut ..	115	122,455	360,500
New York ..	942	1,707,862	5,025,143
New Jersey ..	133	101,485	572,857
Pennsylvania ..	1,039	926,450	3,540,318
Delaware ..	16	26,050	99,350
Maryland ..	116	169,585	628,900
Virginia	341	189,200	676,983
North Carolina ..	151	77,805	251,055
South Carolina ..	91	55,000	184,335
Georgia	140	81,484	262,855
Florida	4	2,100	9,400
Alabama ..	149	79,033	200,570
Mississippi ..	92	52,315	145,615
Louisiana ..	15	10,500	38,800
Texas	22	9,350	33,850
Arkansas ..	51	16,450	42,100
Tennessee ..	394	166,944	490,320
Kentucky ..	275	196,200	763,455
Ohio	706	344,280	1,340,389
Michigan ..	60	72,365	236,000
Indiana	358	141,549	519,897
Illinois	96	50,825	188,373
Missouri ..	148	120,667	228,095
Iowa	14	5,340	20,350
Wisconsin ..	8	29,800	78,950
New Mexico ..	1	120	500
Columbia ..	2	5,000	25,000
Total ..	6,263	6,128,970	18,900,557

In addition to these there are upwards of 2,500,000 calf-skins, and 6,000,000 of sheep, goat, and other small skins, tanned and dressed annually in the different States which are not included in these returns.

In the *Foreign Department* there were several exhibitors of leather; these, however, are too well known on this side of the Atlantic to need more than a passing notice. *France* represented her leather-trade most successfully, both by the variety and quality of the specimens exhibited. The *Zollverein Department,* though not equal in variety to the French, was not inferior to it in the quality of the goods. *Austria* contributed largely to this class, one exhibitor especially, J. T. Pollak, of Prague, fully maintained, by the large variety, no less than by the quality of this articles, his well-known character.

In the *Canadian* department some specimens were exhibited of hemlock-tanned sole leather by O. T. Macklem, of Chippewa, C. W., and some roans and moroccos by W. A. Clark of Toronto, who also sent specimens of deer-skins tanned by the Indian process; and some white lamb-skins and other leathers of good colours and quality, suitable for carriage purposes. Samples of the porpoise leather, sent over to the Exhibition of 1851, by C. H. Tetu, of Rivière Ouelle, C. E., were again exhibited, and excited much attention. This might have been, and indeed ought to have been, by this time an important article of manufacture, as a ready and remunerative market would be found in this country for all that could have been sent over. To induce this, and to mark their sense of its importance, the Jury of Class XVI (1851) awarded Mr. Tetu a prize medal. On inquiry, however, I found that no advantage had been taken up to the present time of the recommendations of the Jury, and that one of its objects had thus been rendered unavailable both to the individual and to commerce.

INDIAN RUBBER.—(CLASS XXVIII.)

The display of caoutchouc, and its varied applications in a vulcanized form, was, as might have been expected, very comprehensive, and fully exemplified the many uses to which this important discovery could be applied. These were shewn in Class XXVIII by several different exhibitors; they were, however, all based upon the same principle, that remarkable physical change which caoutchouc undergoes when combined, under certain conditions, with sulphur. The name of "Goodyear" is now so well and so widely known in connexion with this substance and its industrial treatment, that I need only refer to the Jury Returns of 1851, by which it will be seen that a Council Medal was awarded him by the Jury of Class XXVIII (page 593), for the discovery,—the history and particulars of which are there duly recorded. Many difficulties from time to time presented themselves in the general arrangements and working details of the new industry; these have been gradually surmounted, and at present it may be said that the industry is in a most flourishing condition.

Already there are eleven establishments in operation for working the patent processes. Of these eight are in Connecticut. At Newhaven, there are three establishments which make shoes and braces; at Naugatuck, there are three also, at which shoes, gloves, and clothing generally are manufactured; at New Town, there is one establishment for the manufacture of combs, of which $50,000 worth were made in the first six months of their operations; and at "Goodyear," a recently built town, extensive works have been erected for the manufacture of the "hard material," now being just introduced for walking-sticks, furniture, and various ornamental purposes.

In the State of New York there are two establishments, one in the city of New York for the manufacture of railway car-springs, at which 1 ton of caoutchouc is worked up per day for springs alone; and the other at Haarlem, at which general clothing goods are manufactured. At Staten Island there is also an establishment for the manufacture of toys and fancy articles, which already returns upwards of $100,000 per annum, and is daily increasing.

The shoe factories give employment to about 2,000 hands, male and female, and turn out annually between 4,000,000 and 5,000,000 of pairs, having a total market value of between $3,000,000 and $4,000,000 sterling. The number of hands engaged in the other branches of the business is about the same, while the money returns would probably exceed the foregoing account.

CLASS IX.

AGRICULTURAL, HORTICULTURAL, AND DAIRY IMPLEMENTS AND MACHINES.*

In reference to the implements and machines exhibited in this class, I have selected only those of which I think especial mention should be made, whether for the particular service they are intended to perform, or the advantages that would probably result from their introduction into this country. Very many of the machines in use in the States are the same as those originally obtained from this country, without, however, bearing those evidences of improvement adapted to our advanced system of farming; neither, as a class, are their implements and machines made so well or so strongly as our own. Iron, so much dearer than with us, enters but sparingly into their build, and, when it does, it frequently is used in combination with wood, in such a manner that the relative hardness of the two materials is speedily shewn by the unequal wear and tear of the parts in which it is applied. There were many examples of this mode of combination in the machines exhibited, economy of construction being no doubt the cause; however, it is but right to say that my opinions are only based on an examination of the several machines, &c., in the building, as no opportunity was afforded by the Exhibition of seeing them anywhere in motion. Indeed, I very much regretted to find that the trials of the various agricultural implements and machines, which are attended with so much interest to the public and benefit to the farmer in our country, were very generally neglected in the States, or else (save in a few important societies) carried out in such an imperfect manner as to render their results of but little practical value. This opinion, I believe, is shared in by many of the leading agriculturists, and will no doubt receive at their hands that attention which a matter of such real importance is sure to have from enlightened minds. I had an opportunity of being present at several public trials of reaping and mowing machines, and although it was gratifying to see the numbers and the class of persons attending them, and the interest taken in their work, still the want of arrangement and of any standard save that of individual opinion, by which their respective advantages were to be determined, deprived them of the value and importance which they would otherwise have possessed.

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* The Jury awards in reference to the machines, &c., exhibited in this Class will be found in Mr. Dilke's Report, page 16.

My engagements in New York would not permit me to attend the different State Agricultural Societies' trials of reaping and mowing machines, which were held in the latter part of July. These are conducted with more care and attention than those of the local societies, and great desire is shown to arrive at correct comparative results.

At the annual State Fairs a limited display of agricultural machines is made, but no trials take place.

The following are some of the points to which the Committee of the Ohio State Agricultural Society were requested to direct their attention on the trial of reaping and mowing machines, viz.:—

1. Which cuts the crop in the best manner, in different states of weather and ripeness of crop?
2. Which does the most good work, in a given time, at the same rate of speed?
3. Which leaves the cut crop in the best order for binding for grain, for drying for hay, or in the swarth, and out of the way of the machine at the next round?
4. Which causes the least waste?
5. Which is best where the grain is lodged?
6. Which is best when the grain or grass is bent by the wind, or other causes, in the direction of the motion of the machine?
7. Which is best adapted for hilly ground?
8. Which is best adapted for stony or stumpy ground?
9. Which is the least liable to need repairs?
10. Which is the most easily repaired by the farmer in the field, or on the farm, or by an ordinary blacksmith, or carpenter, or wheelwright?
11. What is the cost and weight of each machine?
12. Which, under varied circumstances, will be most economical for the farmer?
13. Which requires least power to drive the machine? Specify the power, and if two horses are sufficient?*

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* The Committee are also requested to note the amount of power in pounds, by the dynamometer, "necessary to give the machine a steady motion, before applying the object to be acted upon, and the actual power while the machine is in operation,"—"the number of revolutions of the drum, or other driving wheel per minute, and the diameter of the drum or wheel,"—"what time was used in experiment,"—"what power was required to perform a given amount of work in one hour,"—"quality of the work, assuming 50 as perfect work, and 25 as representing the work of the cradles" "condition of straw and grain as cut by the machine,"—"condition of the stubble on the field,"—"cost, per acre as compared with the cradle,"—"what are claimed as the particular advantages of the machine, and upon what patent founded." The weight of each machine is to be furnished. Lots should be drawn for each machine, as to the time or order of trial on each kind of grain, and the particular condition of the crop as to ripeness, greenness, lodgement, or leaning or waving by the wind. The Committee may, if they please, grant a second trial to any or all of the machines. Many of these suggestions are due to the New York Agricultural Society Circular.

14. Which requires the least manual labour?

15. Which is best adapted for ridge and furrow?

16. Which has the best cutting apparatus, most easily sharpened, changed and repaired, and least likely to get out of repair?

The reapers to be tried on different kinds of grain, and are to cut no less than three acres each.

The power to operate each machine is to be accurately tested by the dynanometer—the speed to be noted, the width of swarth, the time of cutting the acres cut, the time of any stoppages for repairs, or for any other purpose, and the time of hitching up and preparing the machine for operating, &c.

SUGGESTIONS TO THE COMMITTEE FOR TABULATING RESULTS.

Many of the circumstances and results of the trial, and many of the data necessary to come to a satisfactory conclusion as to the relative merits of the Machines and Implements, may be tabulated in such form, that the record can be kept on the ground with ease, and exhibit at a glance the comparative and absolute advantages, and the defects of the machines. The following table is inserted as offering suggestions as to *some* of the circumstances necessary to be noted, and the committee will supply such others as they shall deem best:—

PATENTEES AND EXHIBITORS.		MACHINES.				ATTENDANCE.		DRAFT.			SPEED.					CUTTING KNIVES.						QUALITY OF THE WORK.						
Patentees.	Exhibitors, or Agents.	Price of Machine.	Weight of Machine.	Width of swarth cut.	Diameter of Reel.	No. of men and boys required.	No. of horses required.	Force, in pounds, to put in uniform motion without cutting.	Working draft, in pounds.	Draft in pounds, to 1 inch of the width of swarth.	Diameter of the driving wheel.	No. of revolutions per minute.	Distance cut per minute, in yards.	Time of cutting 3 acres, including all stoppages.	Advance per minute during the whole cutting.	Width at the base.	Length from base to apex.	Edge of knives, whether sickle or smooth.	Height of the knives and cutting bar from the ground.	Length of the vibration.	Number of vibrations to one revolution of driving wheel.	Quality of the work, 50 being perfect; 25 as perfect work of the scythe.	Condition of the grass or grain when cut, for subsequent operations.	Average length of the straw.	Average length of the stubble.	Mode of delivering, whether on the side, or behind.	Ease or difficulty of the labour connected with the delivery.	Condition of the gavels.
		Dols.	lbs.	ft.	ft.			lbs.	lbs.	lbs.	in.		yds.	h. m.	yds.	in.	in.		in.	in.								
A. B.	E. F.	130	900	4¾	6	2	2	300	375	6	28	36	80	2.23	30	4¾	4	sickle smooth.	5	5½	32	30	good					good
C. D.	G. H.	120	1000	3	0	2	2	400	480	7	38	26	85	2.48	31	3	3½		6	8	26	33	good					good

Although, perhaps, the most prominent class of machines exhibited was that which under its various modified forms is intended for reaping corn and mowing grass, still in agricultural operations, the seed-time precedes the

SLIDE DRILL.
("PENNOCK'S.")

FIGURE I.

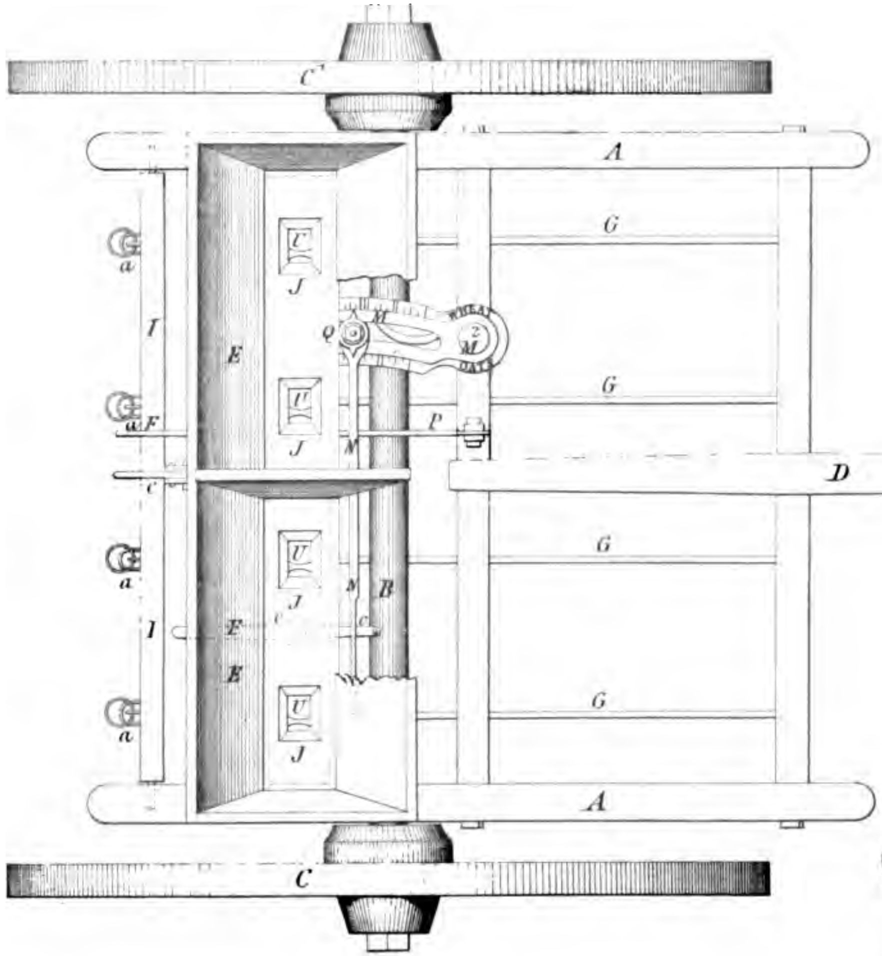


FIGURE 2.

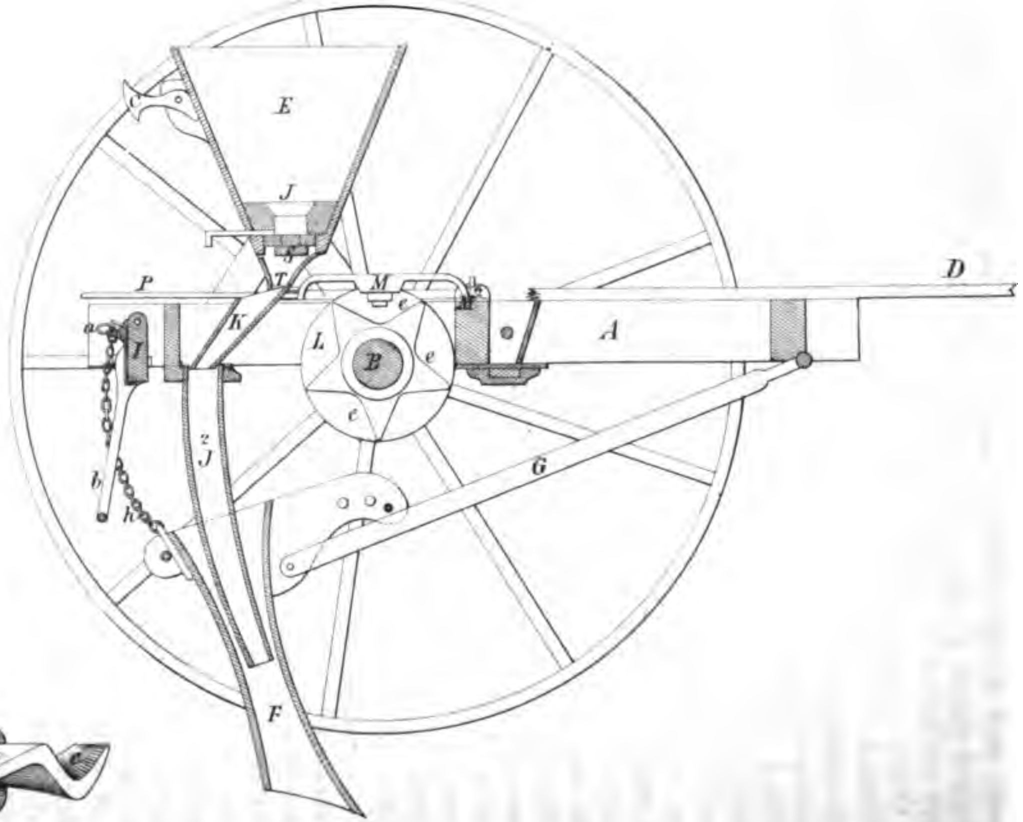
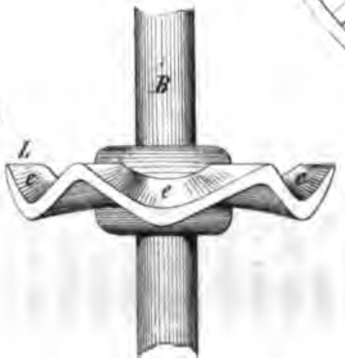


FIG. 3.



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harvest; and as the only *drill-sowing* machine exhibited appeared to me to have good claims to our notice, I will take that before enumerating the several reapers exhibited for public inspection.

This *drill-machine* was on the slide principle, and was exhibited by S. and M. Pennock, of Chester county, Pennsylvania. Its construction was inexpensive, and the arrangements, by which different quantities of various grains could be be sown so simple, that I have thought it desirable to give a working draught of it, so that it may be critically compared with those in such general use in this country, and its relative merits or disadvantages made known. The machine (about six feet wide) is sold at $60, say £12, and has received several premiums during the last two years. In 1852, it took the first premium of the Pennsylvania State Agricultural Society, and of the Philadelphia County Agricultural Society; and in 1853, the first premium of the Metropolitan Mechanics' Institute, at Washington, D. C., and of the Chester County Horticultural Society.

The following description of the principal working parts of the machine will assist in making the sketch intelligible.

A is the frame, mounted on shaft B, and supported by two carrying wheels CC″, one of which, C′, turns loosely on the shaft, for facility in turning. D is the draught pole. A short distance above the frame A, and behind the shaft B is mounted the seed-hopper E, furnished with a given number of divisional compartments. F is one of the depositing tubes with couler at bottom, connected by the drag-bar G to the front beam of the frame, or by the chain *h* to the lifting lever I, which is pivoted to the side-beams of the frame, with pins within and above the staple *a*, through which staples and upon which said pins the chains *h* are hooked when it is desired to raise the depositing tubes separately from the ground. The lifting lever I is provided with an arm or raising handle *b*, by which, when raised, it may be locked to the catch *c*; this enables all the tubes to be elevated simultaneously, and to be held in that position. J is the hole or aperture through which the seed passes into the seed-cup placed beneath the hopper. K is the inclined spout, carrying the seed from the cup to the conducting tube J^2. On the shaft B, near to the loose wheel C′, is fixed an undulating disc or cam-wheel, L, the face whereof is composed of double inclines *e e e* (*fig.* 3), for the purpose of imparting to a lever M, having its fulcrum at M^3, a reciprocating movement, and by means of a connecting-rod N, attached to the lever M by a clamp-screw Q, the shank of which passes into and through a gauge slot, which forms the segment of a circle scribed from the connection of the rod N with the arm O. The advantage of the segment slot in the lever M is, that it admits of gauging the amount of seed to be sown to any fractional part of a given quantity. This quantity is regulated by changing the index point. The stroke of the slide S may be increased or diminished so as to sow more or less grain, by shifting the point of connection of the rod N with the guage lever in the slot, nearer to, or further from, the fulcrum M^2, and then securing it by the clamp screw Q. P is a jointed rod attached to the frame, and extending beneath the connecting rod N and hopper, for the purpose of disconnecting the rod N from the arm O, thus stopping the motion of the slide. S is the reciprocating slide, having its bearing upon and moving over metal seed-cups T secured to the bottom of the hopper, and furnished with stubs or projections U, for feeding the seed through the opening J.

These are the principal parts in the machine; the description of the mode in which the slides work is not so easy without giving detailed drawings of them.* They are so arranged that either can be shut off without stopping the others, and that should the machine when in motion by accident be thrown into gear, the slide S would not act until the drill-man brought it in connection with the rod N. Care has been taken to effect an uniform discharge on rough or hilly ground, and also that the smaller seeds shall be sown as readily and as accurately as the larger ones.

Of *reaping* and *mowing* machines several were to be seen. Both of those so well known in this country were there,—Hussey's of Baltimore, and McCormack's of Chicago, Illinois,—and both, thanks principally, I was told, to their unopposed achievements in this country, have an increased reputation and a large sale at home. Their peculiar features are too well known to need any mention here. The price at which they are sold is considerably higher than they are sold for here, Hussey's being $115 or £24, and McCormack's $125 or about £26.

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* These can be inspected by any machine maker interested in the subject.—I. W.

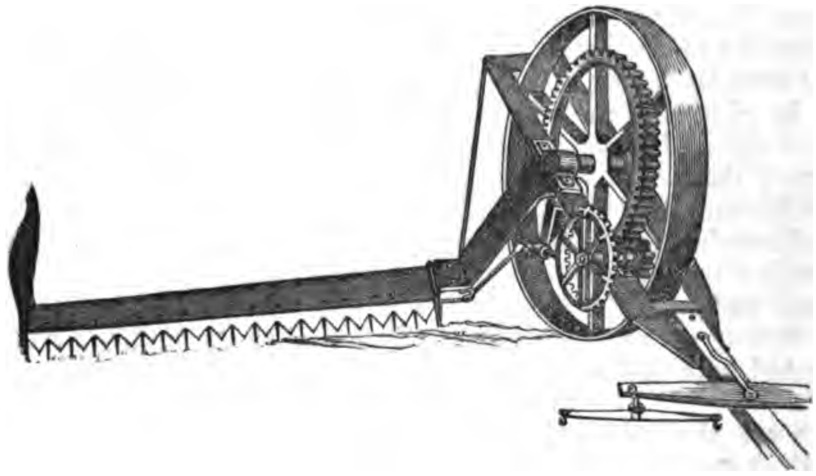
J. D. Burrel, of Geneva, New York, exhibited a *reaping machine*, and also a mowing machine, the former selling at $160, and the latter at $120. They were both well-made machines, on the same principle of cutting as Hussey's; the framework entirely of cast-iron, very simple in construction, and efficient in the field. The crank pinion was worked directly by the large driving wheel, and the stroke was long enough to carry the knife through two divisions of the fingers, or teeth, thus preventing the clogging, which frequently impedes the action of the knife when the stroke is short, or when the substance to be cut is at all succulent.

A *reaping-machine*, similar in form to McCormack's, was exhibited by Seymour and Morgan, of Brockport, New York; the only apparent difference was in the delivery of the cut grain, which in this machine took place at the side. It appears to possess a good reputation, although by a late decision of the law courts the makers were condemned to pay $17,000 to Mr. McCormack as damages for the alleged piracy of his patented principle. The machine was well made and of light draught. It took the first prize in Ohio in 1852 and in 1853, and also at the trial in Renssalaer county, New York, in 1853.

Another machine of similar construction was exhibited by J. H. Manny, of Freeport, Illinois. This is arranged both for *reaping and mowing*, as indeed are most of them. It took a first prize as a mower, and second as a reaper in 1852. At the great trial held at Geneva, New York, it did very good work. Last year, however (1853), it was not so successful, owing probably to sundry alterations it had undergone, with a view to reduce its price.

Of Ketchum's patent *mowing-machine*, made by Howard and Co., of Buffalo, which I had several opportunities of seeing at work, I was induced to form a very high opinion. It did its work well, and being made in iron, and less complicated in its arrangements than most of the others (save Burrel's), is not likely readily to get out of repair. The machine is of light draught, and will cut from 9 to 12 acres of grass per day with a regularity equal to the best scythe work. The selling price, with two sets of knives, &c., is $110, or about £22.

As this description of mowing machine has not yet been introduced to any extent into this country, the sketch now given will show its arrangement.



A machine, very similar in construction to the last-mentioned, was exhibited by E. D. Forbush, of Buffalo. Of this I could learn nothing, save that it had never been tried in public, owing to an injunction which had been issued against it as an infringement of Ketchum's patent.

All these were examples of what may be termed the ordinary reaping machine, arranged for the purpose simply of cutting the grain.

There were, however, two or three others exhibited, differing somewhat in construction, and for which additional capabilities were claimed. One of these was sent from San Francisco by A. Elliot, and was termed the "golden harvester." Its proportions were somewhat large for a field machine, and it was stated to be able not only to cut the corn, but also to lay it into sheaves, and then to bind them.

Another reaping machine, of gigantic size, the cutting-frame being 8½ feet long, was exhibited by Gregg and Denton, of Peoria, Illinois. This had a self-raking contrivance, delivering by an endless band over the side into a hopper or cradle which was discharged when it contained sufficient to form a sheaf. The price of the machine is, according to the size, from $120 to $160. In other respects it was of the same construction as the common machines.

The "automaton" *self-raking reaper*, patented by Atkins, was sent by its maker, J. S. Wright, of Chicago, Illinois. This was decidedly the best representative of its class, and is not unknown in this country, Mr. Wright having sent over one some eighteen months or two years ago. The mechanical arrangements for effecting the purposes intended are extremely pretty; they add, however, considerably to the cost of the machine, and after all only perform a duty which would be quite as efficiently performed by a travelling band, which might be made to deliver the cut straw either behind or at the side. It is right to state that this machine has been successful at almost every place at which it has been exhibited. In 1852 it took the first premiums at the following places:—Ohio State Agricultural Society; Michigan State Agricultural Society; Wisconsin State Agricultural Society; Kenosha County (Wisconsin) Agricultural Society; Racine County (Wisconsin) Agricultural Society; Buel Institute (Illinois,); Mechanics' Institute (Chicago, Illinois); American Institute (New York city). The price of the machine at Chicago is $175.

In neither case could I obtain any information of the work of these several machines in the field, and the great distance of their respective localities from New-York reduced the probabilities of meeting with any one who had seen them in operation. In all the cutting-movement was effected by a straight knife, worked by a crank similar to McCormack's and Hussey's.

The only attempt at a circular movement was shown in a small model of a reaper, which consisted of a frame carrying two vertical cylinders, arranged side by side, the lower edges of which were armed with short curved knives, set on with their cutting-face towards the common centre. On the upper portions of the cylinders small rakes or teeth were fixed, and an open space, equal, in the full-sized machine, to about 12 or 15 inches in width, was left between them. When the machine was put in operation, motion would be communicated by the carrying-wheels to the cylinders in such a manner that they should both rotate towards each other. The corn would in that case be rapidly cut by the curved knives below, and the rake or teeth above would both hold up the straw while being cut, and then carry it round, and clearing themselves on a fixed frame, deliver it in a straight line at the back of the machine.

Two machines were exhibited for separating the seeding heads of clover, or timothy-grass, from the stalks. One sent by G. J. Naylor, of Brooklyn, resembled very much the old Roman machine, described by Pliny and Palladius, consisting of long teeth with cutting sides set on a frame like a comb. This is arranged at a proper height from the ground, and then forced along through the clover, and catching the heads between the teeth, it separates them by a dragging cut, a box or tray behind receiving them as they fall. The other, exhibited by J. A. Wagener, of Steuben county, New York, is of a different construction. It consists of a box or deep tray carried on wheels, and having in front a small cylinder placed horizontally, round which are fixed two or more spiral knives. When the machine is in motion, these work, in combination with some curved spring-teeth, against a straight steel or iron edge, thus forming a kind of shears, by which the heads are severed from the stem, and fall into the tray or box behind Both machines are readily adjusted to suit the height of the plant to be cut.

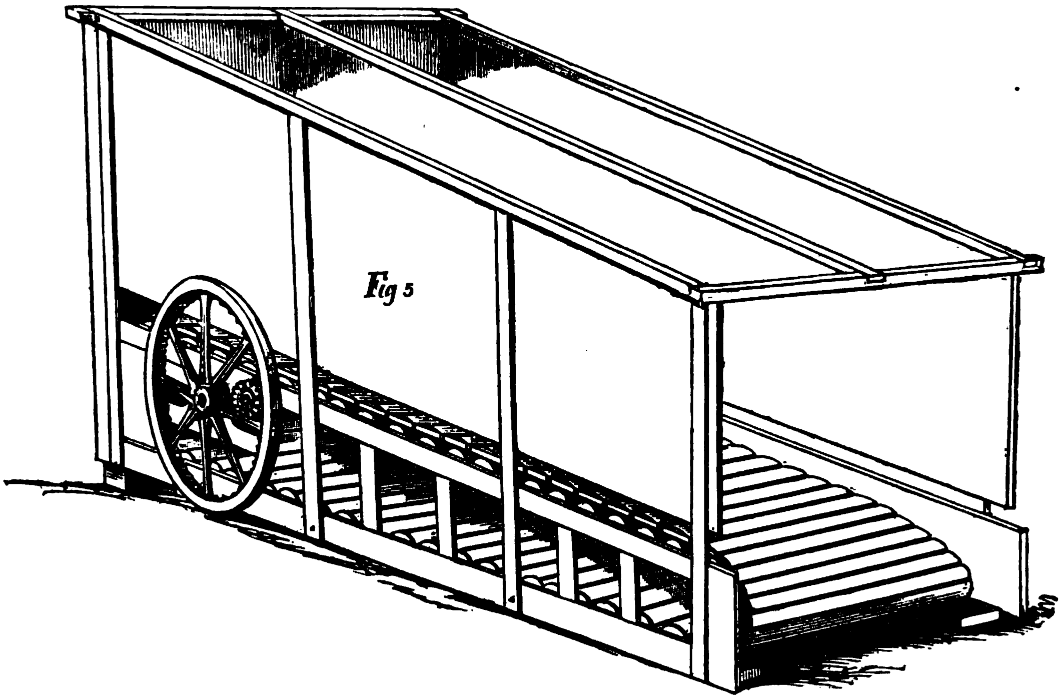
Two models of machines were exhibited for cutting down Indian corn, or hemp,—one by J. L. Ream, of Pulaski, Illinois; the other by W. B. Coates, of Washington, D. C. This latter appeared to be of the most effective construction, and consisted of a frame about 4 feet wide, on which were fixed, horizontally, two pair of forks or diverging fingers; the centre of each pair being set at a distance equal to that between the rows of corn or hemp to be cut. This would be drawn by power applied at the side, as in the reaping machines, up against the rows of standing corn, which, being guided by the forked fingers of the machine in the proper direction, is cut off by a lateral slanting blow of a heavy knife attached to and set in motion by the machine, and falls behind it on the ground.

The next machine in sequence of farm operations would be the threshing machine, of which several were exhibited, but as all these require power to put them in operation, it will be best to describe the *horse-powers* made use of first. Of these there are two, based upon very different mechanical principles: the one known as the "sweep, or lever-horse power," similar to that commonly used in this country; and the other, peculiar to North America, is called,—the "rotary," or "railroad horse power," in which motion is given to an endless chain directly, by the weight and muscular power of the animal pressing on it.

Of the former, there were several exhibited, two of which, however, presented points which appear to be worthy of notice, as tending to lessen the great loss sustained in "bringing up the speed" in the ordinary "horse power." These two were somewhat similar in construction, the difference between them being that the one (Taplin's) communicated its power by means of a cogged wheel of large diameter working directly into another or driving-wheel of smaller diameter, while the other (Palmer's) substituted a band for the large wheel, and thus drove the smaller wheel, over which it passed. The accompanying sketch of Taplin's will, I hope, render the arrangement of both machines readily understood.

a. Wooden frame, carrying driving-wheel and shaft.
b. Segmental cogged wheel of large diameter, working into—
c. Cogged driving-wheel.
d. Stout wooden frame, carrying horse-wheel, &c.
e. Small friction-roller, running on top of large wheel, to keep its bearing true.
f. Shaft from driving-wheel.
gg. Openings to admit horses.

The "railroad," or endless-chain power, is used far and wide throughout the Union, and for all purposes where power is needed. It may be seen daily in operation, driving threshing machines, circular-saws, cotton-gins, elevators at the granaries and stores, ferry-boats, pile-driving, grinding, churning, &c., for all of which purposes it is well adapted, owing to the direct and immediate manner in which it communicates motion, and to its general compactness, cheapness, and facility of being moved about. These are made by almost every agricultural machine maker in the States, and as they vary but slightly in details of construction, and many have high local reputations, I have selected Emery's for description, the first premium having been adjudged to it by the New York State Agricultural Society, at the trial of implements held at Geneva in the autumn of 1852.*



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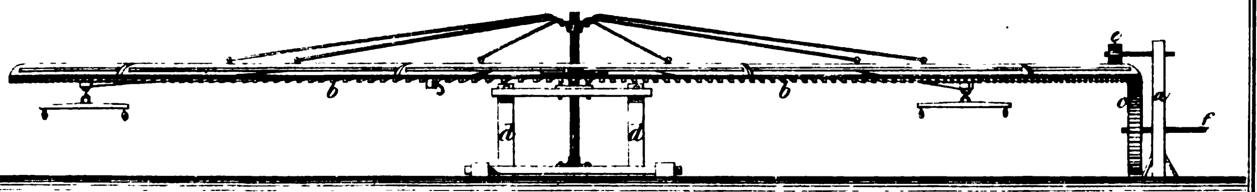
* As regards the mode of communicating motion, neither of these powers are to be considered as entirely new in this country. A modified arrangement of the "sweep" power is common in the ordinary horse mills, and the "rotary power" was, I believe, applied on the Greenwich Railroad some fourteen or fifteen years ago, and, more recently, for a similar purpose, on the South Western line. The object of the present notice is their advantageous application to agricultural purposes.

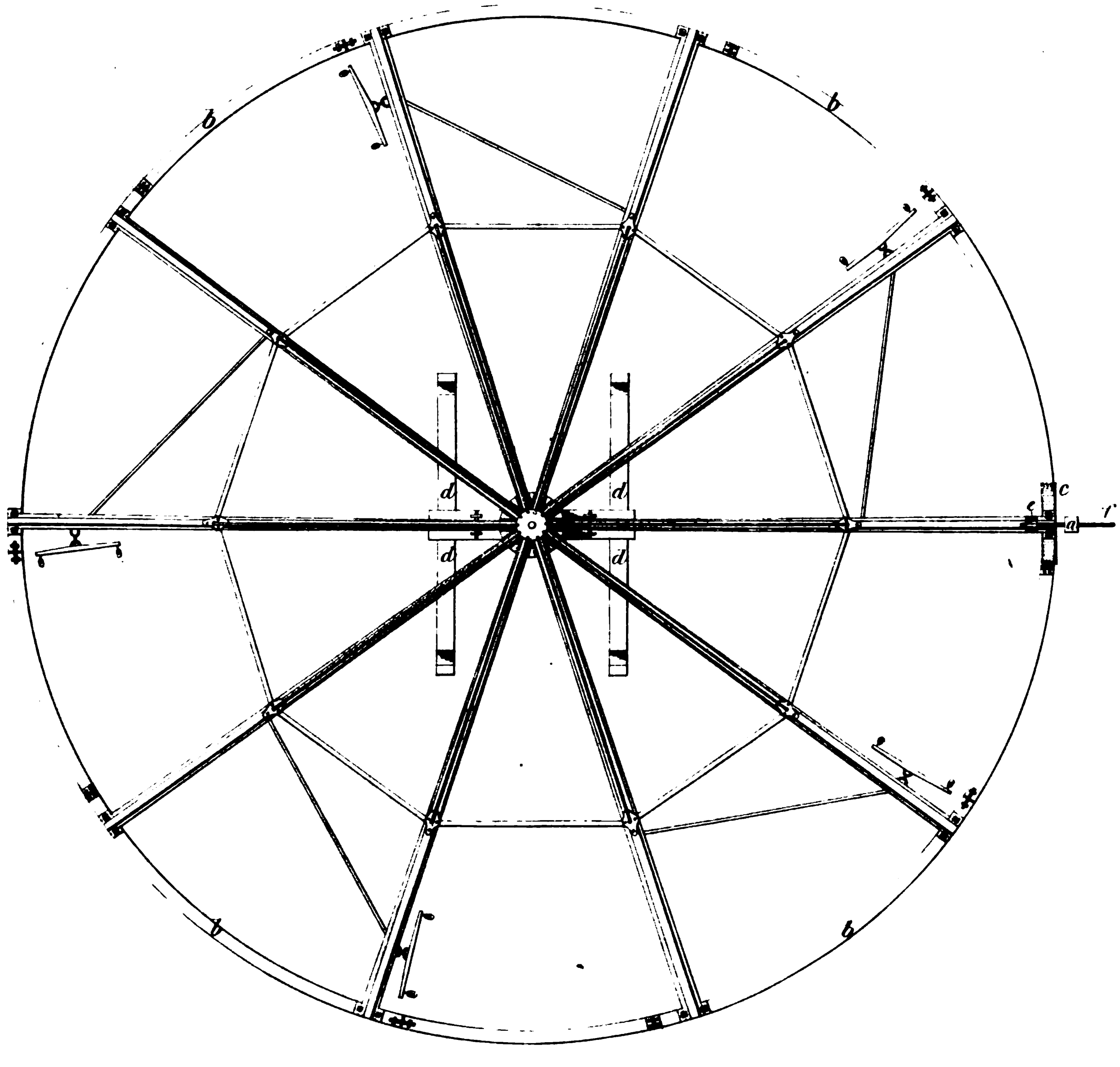
SWEEP HORSE POWER.

(TAPLINS.)

SIDE ELEVATION.



PLAN.



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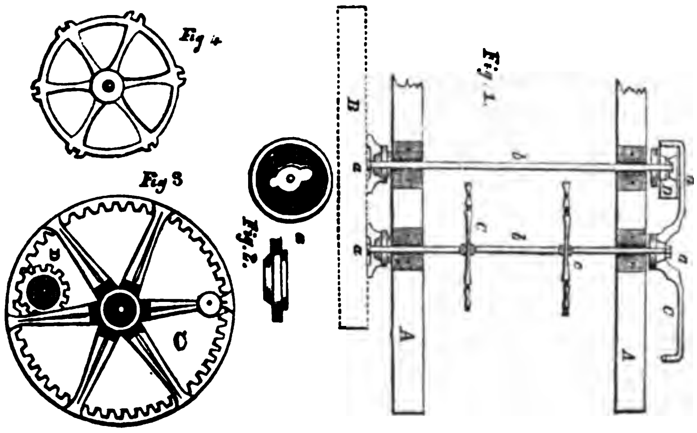
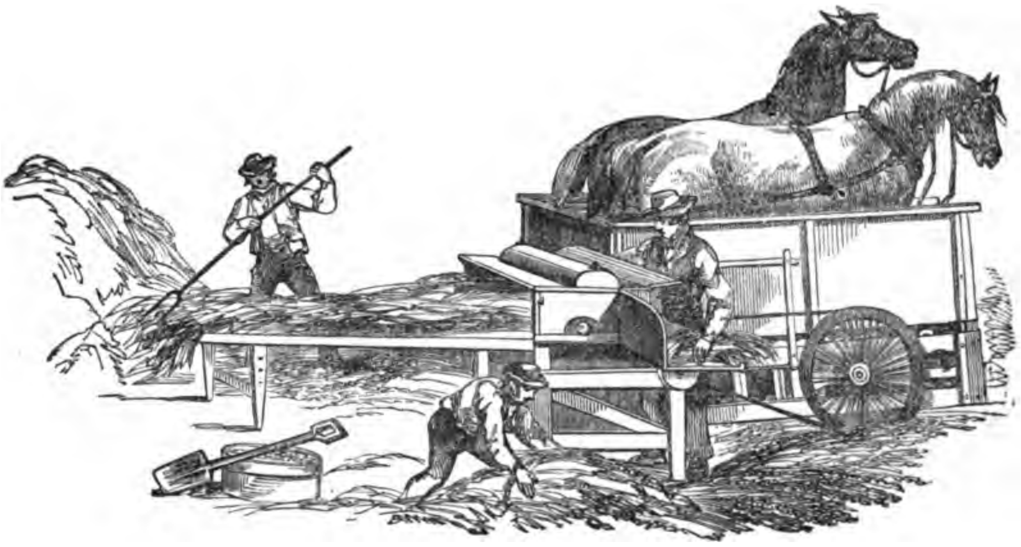


Fig. 1—A A. Main sills, or frame of the machine, carrying the shafts.
B. Band pulley upon one of the shafts.
D. Pinion, or small gear, upon the same shaft as pulley.
C. Converge, or internal gear upon the main shaft, and working into and over the pinion.
a a a a. Couplings upon the ends of the shafts fitting all the pulleys and gears.
b b. Main and counter shafts of machine.
c c. Reels upon the main shaft which are driven by the endless track or floor.
Fig. 2. Shows a side and edge view of the couplings.
Fig. 3. Side view of C.
Fig. 4. Side view of reels *c c* on main shaft.
Fig. 5. The machine ready for use.

The accompanying sketch shows the mode in which this power is applied when in operation on a farm.



Threshing Machines were well represented, several being exhibited; all of them, however, with one exception, were various modifications of the *peg principle,* the difference being seen either in the material or the shape of the peg, the mode in which it was fixed, the shape and position of the concave, or the arrangement of the feeding-tray or board. This description of machine, although not new in this country, is still so little known, that a short description of it may be admissible.

In external construction, it resembles the ordinary machine; the threshing is effected by a cylinder, either of wood or iron, which is armed on its external surface at regulated distances with small wrought-iron spikes or pegs, strongly fastened on by means of screws with nuts on the inside; the concave, or apron, is armed in the same manner, due care being taken that the spikes or pegs are fixed in such a manner that when the machine is in motion they shall work clear of each other, and at such distances apart as to allow the straw to pass between them, but sufficiently close to prevent the ear passing also. This portion of the plant, being thicker than the stem, is exposed to the force of the pegs of the cylinder while passing rapidly through the fixed pegs of the concave, and the grain is stripped off the straw rather by the friction of two surfaces than by any direct blow. The grain and straw are delivered from the machine in the ordinary way. It is customary to drive the peg-drums, or cylinders, at a much higher speed than we drive the beating cylinders, and, generally, a considerable increase of work is got out of them.

Public attention has recently been called to these machines by the introduction, last Christmas, of one of those exhibited at New York; and their history and merits were then so fully discussed by the various agricultural journals that I need only mention my having seen them do very excellent work during my visit in the States, which confirmed the favourable opinion I had formed of them when I first saw them in operation in Scotland, some 10 or 12 years ago. The only point of real objection to their use appears to exist in the greater amount of risk of injury to the feeder from any stones or solid substances that might be carried into the machine with the straw, or from any accident happening to the pegs themselves. Simple precautionary means, however, may be devised by which such chances may be materially diminished; and mechanical arrangements might readily be effected by which the injury to the straw, generally complained of, would not exceed that done by other machines.

Besides these peg-machines, there was a threshing-machine exhibited by the inventor, W. R. Palmer, of North Carolina, of an entirely novel description, extremely simple in construction, compact, and occupying but little room, and having the character of being a most efficient machine for threshing all descriptions of grain, save Indian corn.

The machine is, in appearance, similar to a large case or box, about 5 feet high, 5 feet broad, and 2 feet wide, with an aperture on one side for receiving, and another at the end for discharging the substances operated upon. In the accompanying plate all the principal points are given. *Fig.* 1 is a vertical section of the machine in its breadth, and *fig.* 3 is a vertical section of it in its width. AAAA are four arms or beaters, radiating from the common centre or nave A^2, which is keyed on the pinion F. Fixed to the frame D are grooved plates, or rubbers (BB), which are attached to both sides of the lowermost half of the machine. These are susceptible of adjustment by the mode shown in *fig.* 3 and 4. E is the pulley keyed on to the pinion or shaft F, and communicating motion to the machine. *Fig.* 5 shows the back frame of the rubber. *Fig.* 6 shows the ends of the rubber and flange.

The machine being set in motion, its *modus operandi* is as follows:—A feeding-board is fixed either to one or both of the sides, and the sheaves are unbound and fed in at the open part (C) as fast as the men can handle them. The heads are thus brought into contact with the revolving arms or beaters ($^{A}_{A}$), which are driven at high velocities, and a greater portion of the grain, if in good condition, is at once separated. The straw is at the same time carried round by the rotary motion of the beaters, and in its passage is drawn against the grooved sides (rubbers) (B) of the shield or case, which strip off any grains that may remain attached to it, and is then, by its own centrifugal force, thrown out at the back through an aperture arranged for its discharge. The sides of the machine admit of its being adjusted so as to suit any description of seed; with the larger grain, in good condition, they are set at a greater width than when the grain is damp or shrivelled, or for finer seeds. When the straw is required for thatching, or other special purposes, the feeder merely exposes the ears to the action of the beaters, and lays the straw aside; in this case, the mode of working it is similar to our flax scutching-frames.

I had no opportunity afforded me of seeing the machine in action; its general arrangement, however, pleased me much, and the character I had of it, both from public testimonials and from private sources, was very satisfactory. It was very favourably reported upon by the Committee on Threshing Machines at the fair

ROTARY THRESHING MACHINE

(PALMER'S)

Fig. 1.

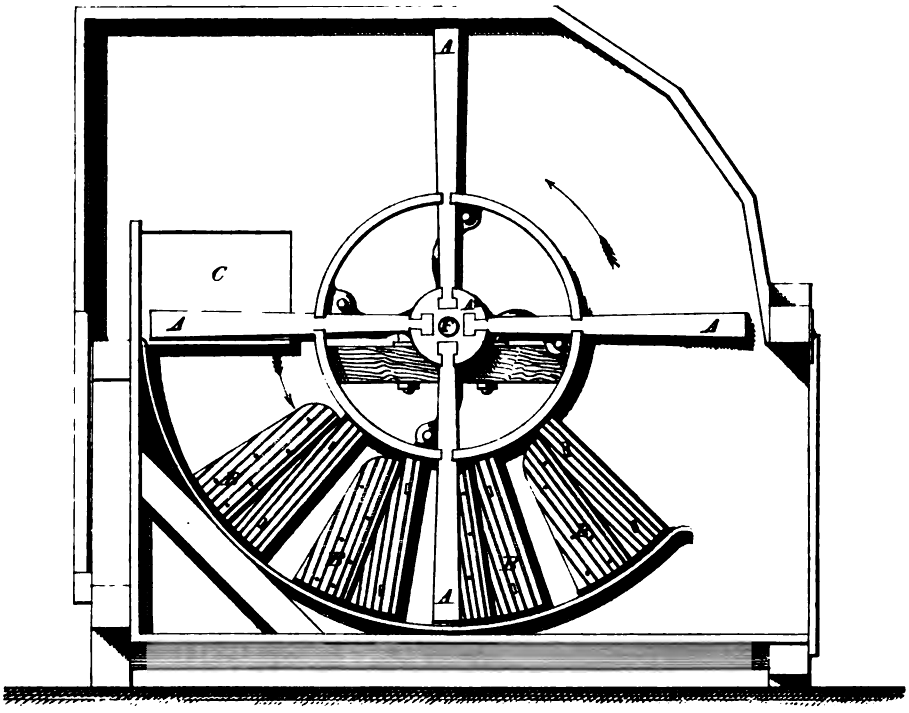


Fig. 2.

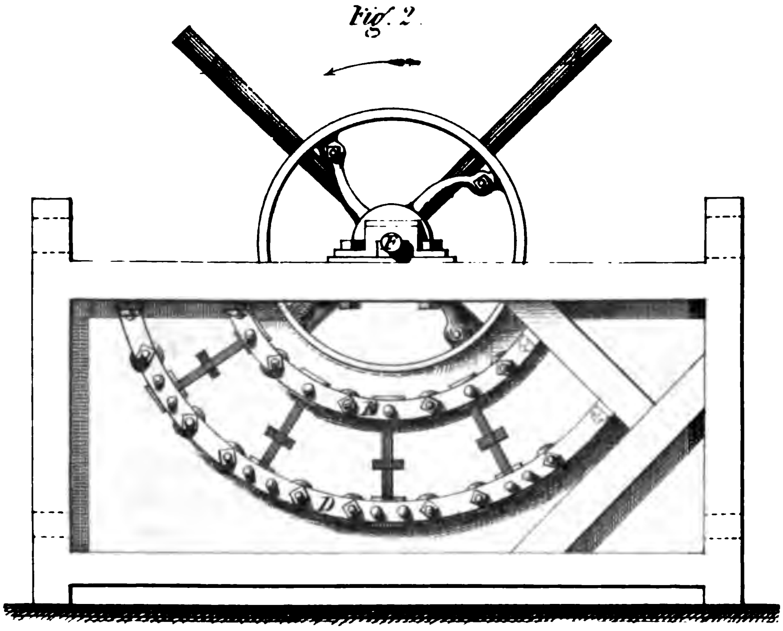


Fig. 3.

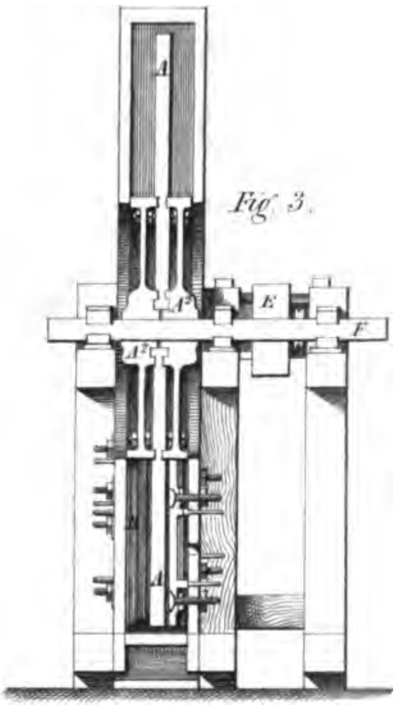


Fig. 4.

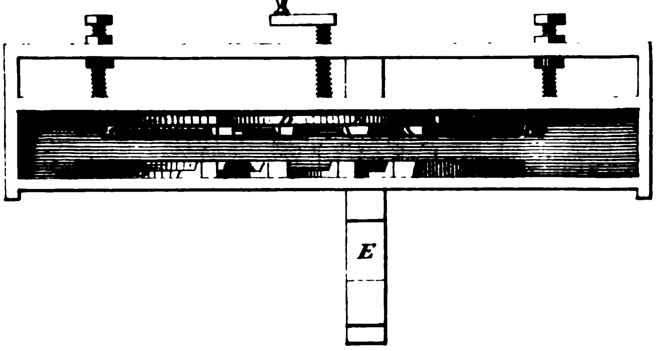


Fig. 5.

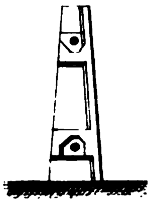
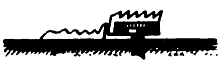


Fig. 6.



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of the American Institute in 1852, and received the silver medal, as being the best threshing-machine exhibited. It likewise has been very successful in different exhibitions in North Carolina. I could not obtain the exact price at which the machines were sold, but was informed that it was below that at which ordinary threshing-machines were supplied; neither could I obtain any definite evidence that satisfied me of its threshing capabilities in relation to the power consumed by it. Its simplicity of construction, compactness, and apparent economy both in cost and power required, render it, in my opinion, worthy of a trial in this country.

Of *separators*, there were several very excellent ones exhibited; amongst those which appeared to me worthy of notice was the "patent grain separator for millers and farmers use," exhibited by A. B. Childs, of Rochester, New York, which was very highly spoken of, and extensively used in the northern parts of the State.

Grant's *separator*, and also that exhibited by G. B. Salmon, of Elgin, Illinois, were well-made and well-arranged machines; the latter, from its simplicity and effective arrangements, appeared well adapted for the purposes for which they were intended.

A machine was exhibited by Carr and Hughes, of Cambridge, Indiana, which they termed a "bran-duster, or atmospheric bolt," and by which they stated that they were able to obtain from 2 to 5 per cent. of flour from ordinary bran.

Two machines, of somewhat similar principles, and for similar purposes, were exhibited, the one by R. C. Pratt, of Canandaigua, entered as a "rotary ditching machine for draining land;" the other by W. D. Arnott, of Fairfield, Iowa, intended for digging ditches and grading roads. The first consisted of an iron wheel, 4 feet in diameter, with iron scoops fixed on its circumference, and mounted on a pair of carrying wheels. When in operation the centre is let down according to the depth desired, and the scoops by the rotary motion of the machine are forced into the soil, which they take up and deliver over the side, and clear of the track of the machine. It was worked by horse-power, and stated to be able to dig 150 rods, 2 feet deep, in the day. Gibb and Co.'s machine consisted of 2 parallel discs set on the same axle, about 1 foot apart, and mounted as the last on a pair of carrying-wheels. These discs were armed on their circumference with broad, flat, curved iron tires, 9 inches long and 4 inches wide, which are forced into the ground when the machine is in motion, and tear it up. Both of the machines bear a resemblance to those brought out in this country within the last few years, as representing rather the action of the spade than the plough in the necessary process of turning over the surface soil. Neither of them appeared very suitable for the purposes intended; the first was certainly too light, both in weight and materials, to stand the work, and the latter in operation left a strip of soil untouched some 8 inches wide, between the two sets of tires, which it is not very probable would be moved to more than a very small extent by the action of the tires at the side of it.

A very large collection of *straw and chaff cutters* was exhibited; not one, however, was equal to the work we are accustomed to expect from them at home. That in common use is similar to one which was exhibited in the Zollverein department in 1851, and consists simply of an open box, at one end of which is fixed a spiral knife, set on a stout iron centre, above which, at a small distance, is fixed a roller covered either with untanned hide or gutta percha. Between these two the substance to be cut is forced, the separation being effected by the pressure of the knife against the roller.

A machine for cutting straw, exhibited by Taylor, Thomas, and Co., of New York, was of a different construction, and appeared a more efficient machine. In this, the cutting was effected by a series of short knives fixed into a cylinder or roller of wood, extending the whole length of the bottom of the box (about 3 feet) in which the straw was laid. A rotary motion was given to the cutting roller, and the straw being pressed down on it was cut into fixed lengths by the knives, and fell through on to the floor or into a basket placed beneath.

Another machine for straw-cutting was exhibited, of very similar shape and construction. In this, however, the knives *were fixed* in the bottom frame of the box, and, when in motion, a cylinder, armed with long curved spikes or fingers, collected the straw which was fed in above, and pressed it across the knives, thus effecting the separation in much the same manner, the only difference being that in the one the *moving knives* were pressed against the straw, and in the other the straw was pressed against the *fixed knives.* No mode existed for altering the length of the cut, neither do the farm arrangements of the States at present require that economy in the consumption of fodder which render chaff-cutting machines so valuable to us.

Ploughs were very well represented in the building, specimens of almost every variety in ordinary use being exhibited, from the light single-horse plough used by the cotton-planters in the Southern States, where 2 inches is probably the depth they are required to work, to the powerful sod-plough used both in the Western and the New England States, which is intended to turn a furrow from 12 to 15 inches deep, and from 15 to 18 inches wide. These ploughs, presenting many points of difference from our own, excited much attention in 1851, when their merits were very freely discussed both by those who saw them in the building, and those who witnessed them while competing with other ploughs in the trials which took place during their examination by the jury of Class IX. The general opinion then formed I believe was, that in lightness of weight or of draught they were fully equal to our own ploughs, though, owing to the shortness of the sole and of the mould-board, they did not make quite such neat work. On the other hand, they left the furrow slice in a more broken and rough condition, which, for all purposes save lea-ploughing, would be desirable; and they possessed one important and decided advantage in being only about one-half to two-thirds the price of ours.

The plough, symbolical as it always has been of agriculture, is especially the farmers' implement in a new country; and from the time of President Jefferson, who in 1787 contributed a paper on the construction of the mould-board to the French Academy up to the present day, its improvements, either as regards construction or materials used, have been the great object desired by all interested in agricultural pursuits. As with us, the description of plough used varies much with the locality; the physical character of the country, as well as the crops suited to its climate, requiring consideration. The greater portion of the cultivated land in the States still contains the ungrubbed stumps of the trees, its former occupants; here a stout, short, handy plough, that will work readily in and out of the straight furrow, and stand the shock of contact with a root or two, is best suited to the requirements of the case. Again, in the extensive prairies of the Western States, where a rich humous soil exists to the depth of some 10 or 20 feet, with scarcely a stone to interfere with the farmers' work, a different plough is needed; such a plough was exhibited from the State of Michigan, where it has a high reputation, and is termed a "sod and subsoil plough." The frame was of large size, and of the ordinary shape, and, instead of the skim coulter of our ploughs, this one had a small share and mould-board attached to the beam, susceptible of being adjusted to any depth to suit the subsoil plough placed behind. The herbage is so rank and luxuriant that some such arrangement is needed where one plough alone is used, as the surface has to be pared off some three inches deep before you reach the soil. This plough requires four horses to work it, laying the surface sod at the bottom of a furrow from eight to twelve inches in depth. In other cases, the surface sward is removed by a plough with a broad-cutting share running the entire length of the mould-board, and turning over a cut from twelve to fifteen inches wide, and about two inches thick; this is left until dry, and then burnt and ploughed in the ordinary way. I had an opportunity of seeing some very excellent work done by this sward or paring plough in the prairies, west of Chicago, in Illinois.

The subsoil plough of our agriculture is at present hardly known in the States, their tillage operations being chiefly limited to the surface, whose large extent, in relation to the population, is able so readily and so amply to supply their wants. In the North-eastern States the use of the subsoil plough is beginning to find favour with the farmers, and a very useful-looking one was among the implements, &c., exhibited by Messrs. Ruggles, Nourse, and Mason, of Boston. It was constructed on the same principle as the Deanston plough, and was made of different sizes, for from two to six horses, and at a price varying from $5 to $15. The first subsoil plough was imported from England in 1840, by this firm, one of whose members, Mr. Nourse, well-known for his skill and practical mechanical knowledge, took it in hand, and adapted it so as more advantageously to meet the requirements of the American agriculturist.

The ordinary plough in use throughout the States, is made with the beam and stilts, or handles, in wood; ploughs entirely of iron, however, are manufactured to a considerable extent at Pittsburg, in Western Pennsylvania.

Two makers exhibited specimens of their work, Messrs. Eddy and Dyer, of Washington, D.C., and Messrs. Hall and Speers, of Pittsburg. The latter establishment is upon an extensive scale, and is confined solely to the manufacture of iron ploughs, of which about 20,000 to 25,000 are turned out every year by them, at prices varying from $5 up to $15 each. An additional charge is made of $1 50c., where wrought-iron work complete is desired; and where steel mould-boards are ordered, an extra charge is made of half a dollar. Messrs. Hall and Speers sent some of these ploughs over to us in 1851, and were awarded a Prize Medal by the Jury for them.

The application of machinery to the working of wood enables the manufacturers to get up the ordinary ploughs at inconceivably low prices, the smallest size being sold in quantities at the rate of $1¼ each, (equal to about 5*s.* 2*d.*,) out of which I was informed by the manufacturers they could clear about *eight cents net profit.* All the wood-work, including the beam, handles, &c., are made by machinery.*

A very good assortment of ploughs, suitable for different purposes, was exhibited by Minor, Horton, and Co., of Peekskill, New York, who were the first makers in the States of the improved ploughs. In these the mould-boards had a different curve from the ordinary shape, by which the friction would be considerably lessened and neater work done. For general purposes they appeared to be excellent implements.

A large and well-assorted collection of agricultural implements and machines, suitable for general purposes, was exhibited by Messrs. Ruggles, Nourse, and Mason, of Boston, whose deservedly high standing as manufacturers was well supported by the make and general finish of their goods. This firm has long been celebrated for the attention they have paid to the construction of their ploughs, of which their present sale averages about 25,000 annually. The reputation of their ploughs is due chiefly, I believe, to the mould-board, which was devised by the skill of Mr. Nourse, as presenting the least amount of resistance, while effecting its special duty as a turn-furrow. In this the curve is so finely graduated, that a straight-edge or rule applied to it with one end stationary at the share-socket, on being made to pass over the face of the mould-board, will touch every portion of it.

A similar collection was also exhibited by R. L. Allen, of New York, whose ploughs and implements generally have a very good name in the different markets of the States. His sales of ploughs are very large, amounting to from 20,000 to 25,000 per annum.

Of the display of the tools used by hand in farming operations I cannot speak too highly, whether as regards the materials of which they were manufactured, or their particular suitability both in make and shape, for the purposes for which they were intended. The assortment, too, was very large, and contained specimens of the leading articles made by most of the principal establishments. Of these I may cite the following, as appearing to me specially deserving of notice:

The Tuttle Manufacturing Company, Naugatuck, Connecticut, for rakes, hoes, forks, &c.

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* "In a plough manufactory at Baltimore eight different machines are employed at the various parts of the woodwork. With these machines seven men are able to make the wooden portions of thirty ploughs per day. The handle-pieces are shaped by a circular cutter, having four blades similar to those of smoothing planes, fixed on a horizontal axis, with about 2 inches radius, and making nearly 4,000 revolutions per minute. The work to be shaped is fastened to a pattern, which is pressed against a loose roller on the axis of the cutter as the workman passes it along, and it is thus cut off exactly the same shape as the pattern. All the ploughs of a given size are made to the same model, and their parts undergoing similar operations, are made all alike. Some of the sharp edges of the wood are taken off or chamferred by a cutter revolving between two cones; these guide and support the work as it is passed down edgewise on the cutters, and passed along by the workman. The other machines in use comprised a vertical and circular saw, and machines for jointing, tenoning, drilling, and for making round stave-rods, and giving them conical ends, the whole being of a simple and inexpensive character. The curved handle-pieces of the ploughs, which require to be steamed and bent, are obtained already shaped from the forests where they are cut, and are advantageously supplied to the manufacturers."—*Mr. Whitworth's Report, page* 14.

The Old Colony Works, Taunton, Massachusetts, for shovels.

The American Hoe Company, Winsted, Connecticut, for cast-steel hoes.

The Oxford Edge-tool Company, Chenango county, New York, for hoes, axes, chisels, and drawing knives.

The Nassau Shovel Works, Long Island, for shovels.

D. J. Millard, Clayville, New York, for cases of tools; chiefly forks.

The Paris Furnace Company, Oneida county, New York, for scythe blades.

Mansfield and Lamb, Smithfield, Rhode Island, for scythe blades and handles.

Kimball, Worcester, Massachusetts, for shovels.

Oliver Ames and Sons, North Easton, Massachusetts, for shovels and spades.

North and Denis, Fly Creek, New York, for hay and manure forks.

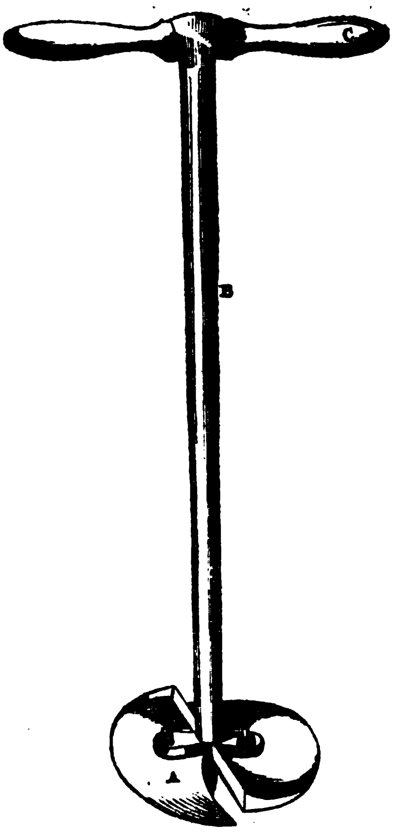
H. Partridge and Co., Medfield, Massachusetts, for forks and drag rakes.

The only comment which I wish to make, is one of some little importance, as it questions the form of a tool which, with the exception of the plough, is more extensively used than any other in the States, namely, the "*cradle*" or *grain scythe*. Of these many were exhibited, differing in the shape of the blade and in the curve and length of the handle; but in all cases I noticed that the fingers or bars of the cradle, which were four or five in number, having a depth of 18 to 24 inches, extended the full length of the blade. Now the scythe, when being used, is worked at an angle with the surface of the soil, and unless the cradle be set at such an angle with the snaith or handle that it shall be vertical to the blade (when being used), it must describe a portion of a larger circle than the blade itself, and thus will have a tendency to catch hold of plants beyond the sweep of the blade, which would in a full crop materially impede its progress, and make slovenly work.

It appears to me that a cradle somewhat less in depth, and extending only half or at most two-thirds of the length of the blade, would be more efficient in its work and far easier to the mower, as the rate at which the sweep of the blade effects the separation of the straw would be too great to allow the straw time to fall, before it would be taken up by the cradle, and carried round to the swathe in the ordinary way. By this arrangement the difference between the circles travelled by the blade and the top of the cradle respectively would be lessened, the resistance offered, should the cradle come in contact with any of the uncut stems, would be reduced, and the work would be cleaner and more speedily done, by thus removing the obstructing parts from the point to the middle of the blade. With cradled scythes of the construction I refer to, I have seen better work done at home than any I was able to meet with in the States, where the average crop is considerably lighter than in this country; and in several instances my suggestions were practically confirmed by the cradlers themselves, who found that they did their work better and with more ease to themselves, when from an accident or otherwise the ends of the cradle-bars had been broken off. The extensive and rapidly increasing use of the reaping machine throughout the States, renders the cradle-scythe of less importance than heretofore to them; but in a country still only partially cleared, and where happily a reaping-hook is not acknowledged in the harvest field, it must always have a value sufficient to excite and repay any attention bestowed upon its construction.

We are indebted to the States for the *steel digging-forks*, which are regularly taking their place among our established farm as well as garden tools. They are now manufactured in this country upon a very considerable scale, and although in point of construction and general efficiency as a tool I think we can compare them successfully with theirs, we have yet to learn how to make them so as to be enabled to send them into the market at the same prices, which run from 75 cents each (retail) for the ordinary four-pronged fork, up to $2 50c. for the largest eight-pronged one. The great difference of selling price between the forks of the two countries is the more remarkable, because it must be remembered that the American manufacturers have to obtain the steel, which is, as regards value, the principal part of the tool, from this country.

I think we might also with advantage adopt another very useful instrument, the "post auger." These are in common use throughout the States,



and where the soil is pretty deep and free from stones, they do their work in an efficient and economical manner. Their construction is very simple, as the annexed sketch shows,—being merely an iron rod (B) of suitable size, with a cast-steel boring disc (A) at the lower end, and a stout cross handle (C) at the upper. The mode of using it needs no description. The price varies with the sizes, from $3 to $6; those having a diameter of 6 inches are sold at $4; 8 inches $4 50c.; 10 inches $5. They are considered to save four-fifths of the labour in digging a hole.

In Class VI, "Machinery in Motion," two machines of some interest were exhibited by L. S. Chichester, of New York; one for rolling and breaking flax, and the other for scutching or dressing it. The *breaker* is a machine furnished with a feeding-tray, on which the flax-straw is evenly spread out and then entered into the bite of a pair of smooth iron rollers, which flatten the straw and split it up longitudinally, as it is carried forward through a pair of fluted rollers into the bite of a pair of large breaking-cylinders, which form the body of the machine, and from which the straw is delivered on to a receiving-apron, in a thoroughly crushed condition. These breaking-cylinders are each formed by securing near the opposite ends of a shaft, a pair of iron-heads or flanges perforated with radial slots, into which are inserted breaking-plates, or ribs of iron (worked to a smooth edge on top), which are free to move in and out, either towards or from the centre of the cylinder-heads, as they are guided by springs and cams, arranged in such a manner that the ends of every other rib or plate in each cylinder project through the radial slots in the cylinder-heads, and rest upon stationary cams placed outside of the heads, and all the intermediate plates or ribs rest upon spiral springs, supported by circular flanges keyed on the shafts just inside and close to the cylinder-heads. These flanges are perforated with holes, forming sockets in their periphery, to receive and support the spiral springs and admit the iron pins which pass through and sustain the springs, and are fastened to the under edge of the pressure-plates or ribs. As the cylinders revolve together (one being placed over the other) the cam-plates or ribs of the lower cylinder are guided upwards, and meet and carry back the spring or pressure-plates of the upper cylinder;—at the same time the cam-plates or ribs of the upper cylinder are in the same manner guided downwards and meet and carry back the pressure-plates of the lower cylinder.

These cylinders, in their operation and action upon the flax-straw, were designed to imitate the movements and effect which take place when a portion of steeped flax is tested by the hand in the ordinary way. The woody part is thoroughly broken up, and by the pressure of the fixed cam-plates or ribs of the one cylinder working against the elastic pressure-plates of the other, and being, at the same time, subjected to a gentle pulling or drawing motion in opposite directions, a large portion of it is separated, and falling through the machine to the floor beneath, leaves the rough fibre ready for scutching.

The machine for *scutching or dressing* the flax was upon an entirely new construction. Those in common use with us, whether worked by hand or power, are upon the same principle, the blow being given in the direction of the fibre, and all particles of woody fibre or "shove" being forcibly torn off, occasioning more or less injury to the fibre, according to the manner in which the retting process has been carried out. In scutching by hand the flax is laid over the edge of an upright board or chair, and struck with a short sword-shaped beater or "swingle." Where power is used, several of these are fixed into a shaft and set in motion, so as to revolve with great velocity near a slot cut into an upright board or frame, through which the flax is introduced and submitted to the action of the blades.

This new scutching machine consists of two conical cylinders, formed on parallel shafts, revolving towards each other, and driven by a pair of gear-wheels fixed on to the shafts outside the frame. These cylinders are each formed of four large conical spiral blades of wood, secured to flanges of iron, which are keyed on to opposite ends of the shafts, and placed one over the other, revolving at equal speed towards each other. The cylinders are inclosed, in front and behind, with a wood or sheet-iron casing. An opening is left in the front part of the casing through its whole length along the bite of the cylinders, and on the opposite side a suitable trough or box is arranged with a door, to collect and carry out the "shove," &c., dressed out of the mass. These openings in the casing have the effect of circulating a current of air through the machine, the admission being given at the front opening, it passes out at the back and carries with it the dust and fine particles of fibre which are so unpleasant and injurious to the ordinary process. In operation, the rough fibre is fed in through the front opening at one extremity of it, the blades of the revolving cylinder draw in the mass, striking at the commencement alternately on one side and on the other, nearly *at right angles* with the line of fibre. As the mass is moved along the line of opening, the spiral form of the blades causes a gradual change in the direction of the blows from the commencement, where the blow is given at right angles to the mass, towards the other end of the opening, where the direction of the blows becomes nearly parallel to the line of fibre. The shape of each blade of the cylinders varies in its length; at the feed-end it is blunt and rounded, which gradually changes to a sharp edge at the finishing-end. The strength of the blow, too, is increased as the radius of revolution increases towards the larger end of the coned-cylinder. This arrangement leaves a larger space at the feed-end for the shove &c. dressed out, which of course gradually diminish as the mass advances towards the finishing-end.

I had an opportunity of seeing both these machines in operation several times, and can bear testimony to the efficient manner in which they did their work. It was stated that they required only one-horse power each when in operation, and would finish off (roll, break and scutch) one ton of straw per day. The price of the two machines was $650,—an extreme sum, certainly double what they might be made and sold for here, including the ordinary profits of a patented machine.

At the new flax mills, at Fall River, Rhode Island, belonging to the American Flax Spinning Company, I was shown another new flax-dressing machine in operation, invented by Mr. Clemmons. This did its work very well, but was not, in my opinion, equal, either in arrangement or effect, to that just described.

Before leaving the subject it may be well, perhaps, to mention that Mr. Chichester has also invented a machine for *pulling the flax.* This is everywhere a tedious and expensive operation; and in the States, where labour is so costly, and so difficult to obtain at harvest time, is one that has always been the great obstacle in the way of the cultivation of flax for fibre purposes. This machine had been tried in the past harvest, but some improvements having suggested themselves in its arrangement, it was not exhibited in the building, and its inventor, I found, was naturally enough unwilling to let it be seen before he had completed them. The following sketch, however, will give a tolerably good idea of its construction, and show our own machine-makers how readily the American mechanic applies his powers to meet the requirements of industry, whether it be in the finer operations of the factory or the mere crude labour of the field.

The machine is propelled by a horse harnessed in the centre of the back part, and the flax operated upon is laid in two parallel lines on the ground, intermediate between the track of the horse and of the wheels. In the forward movement of the machine in the field, the standing flax is separated and gathered up between long wedge-shaped projections, forming a breast or front near to the ground, and is then pulled by means of vertical rollers, furnished with arms reaching forward underneath the branching top of the plant, which is thus at each revolution bent over at nearly right angles with its growth, bringing up the lower part of the stem into the bite of vertical rollers, and by them delivered on the ground in regular layers. The rollers are driven by gear-wheels on a shaft receiving motion from the two large carrying-wheels, to which the whole machine is adjusted.

This machine, I was informed, would, with one horse, enable the farmer to lay eight acres of flax on the ground in the working day. The cost of hand-pulling is with us from 10*s*. to 20*s*. per acre; by this machine, if the patentee's statement is correct, it could be done for certainly less than 1*s*., thus effecting a reduction of fully nine-tenths of the cost of labour, and relieving the grower from all anxiety about the work.

I have been thus particular in describing these three machines, because they appear to me to possess advantages superior to those of any other machines for similar purposes with which I have had an opportunity of becoming acquainted.

The pulling-machine would, if its performance in the field is equal to what has been stated, be a most beneficial introduction in our flax-growing districts, where hand-pulling is the universal mode by which the flax is harvested. At the same time, I am strongly of opinion myself that this mode of harvesting by pulling, whether by hand or machine, is not the most advantageous, either for the farmer who produces the straw, or for the manufacturer who has to convert it into fibre. If the tillage operations of the farm are properly attended to, and the seed-land carefully rolled, the crop may be cut down quite close to the ground by one of the many excellent mowing machines so commonly used in the States. The machine would do about ten to twelve acres per day, at a cost not exceeding as many shillings, or even a good scythe-man would cut down from one to two acres a day at about double the above rate.

Hitherto we have always fallen in with the idea that it is necessary that the flax should be pulled up root and all, in order that the greatest possible length of fibre may be secured. For all textile uses, the portion of the fibre of any value exists only in the stem above the ground, and to obtain this in a separate state a chemical process of disintegration has to be carried out in the first place, which is then followed by a mechanical process of separation—viz., breaking and scutching. At the lower part of the plant, the fibrous tissues assume an altered condition, and are strengthened by an increased proportion of woody tissue, and then are finally sealed up by the roots which terminate the plant. If this lower portion were removed, which it would be by the method of harvesting I suggest, the first process of disintegration would be carried out more rapidly, and also more regularly, where large quantities are steeped, as the dried juices of the plant would be more readily acted upon and extracted; while at the same time I am inclined to think that we should lose nothing in the length of the dressed fibre, if we consider the injury it sustains when the ends or butts of the steeped straw are submitted to the action of the scutching-frame. In the improved principle of flax preparation by steam (Watt's patent), and by hot water (Buchanan's patent), in either of which a few hours only are required, this mode of harvesting might be advantageously adopted. At any rate, it would effect a material saving in the cost of field labour, and could be carried out by the common mowing machine without the additional outlay for another machine whose use would be limited to the special purpose of flax-pulling.

There were various other machines, &c., exhibited, which I have not thought it necessary to notice, either because they presented no new features in their construction, or else were such as were not suited to our system of farming.

In these observations on the contents of Class IX, I have only made reference to those more important machines which are either known to our own agriculturists, or which, from the opinion I have formed of them myself, I venture to recommend as worthy of their consideration. Besides these, there were many others exhibited, displaying great mechanical skill, and exemplifying in a high degree the peculiar character and adaptation of the American mind to contrive labour-saving expedients for carrying on even the commonest operations in the economy of the house as well as of the farm. The universal eagerness with which these substitutes for manual labour are received is a constant stimulus to invention, and a great support to the manufacture of agricultural implements and machines, which already occupies a prominent place among the leading manufactures and industries of the States, giving occupation to a large number of skilled workmen, and employing a considerable capital, the results of which may be judged from the Returns of 1850, which give the total value of agricultural implements, &c., at $150,000,000. Of this gross amount it appears that New York has invested $22,084,926; Pennsylvania, $14,722,541; Ohio $12,750,505; Kentucky, $5,169,037; and Virginia, $7,021,772.

In addition to the foregoing details, which I have endeavoured to condense as much as possible, I have to state that opportunities were frequently afforded me while travelling through the country, of visiting various manufacturing establishments, which I have not thought it either necessary or desirable to refer to specially, principally because the processes adopted were either similar to, or not so far advanced as those on this side of the Atlantic.

Some two or three, however, I ought perhaps to mention; amongst those is paper-making,—one establishment for which, the Ivanhoe Mill at Paterson, New Jersey, was upon a scale, as regards completeness, fully equal to the best in this country. At the American Pottery Company, at Jersey city, I found them using flints, obtained from this country, at a cost of $5 per ton (as ballast). The clay was obtained from the bed described at page 4 as traversing the State of New Jersey. The china-clay and feldspar came from Connecticut, the latter costing $8 75 c. per ton at the works. Common ware, for the home market, either plain or coloured—no patterns or printing—was only made at present. The workmen were all foreign—chiefly English; but the *apprentices* were native Americans. The rate of wages was from $1 25 c. to $1 50 c. per day, and in all cases, when practicable, piecework was done. At the glass works at Jersey city and at Brooklyn,* small articles were principally made either by pressure moulds, or blown and cut, between 20 and 30 lathes being worked at each establishment. The colour of the glass was excellent, owing to the beautiful quality of sand used, which was obtained from Berkshire, Connecticut, and from Vermont. The work was carried on by 6-hour shifts, and the wages paid averaged $20 for the 5 days' labour.

In the manufacture of stearine candles, the saponification process is generally adopted. The only establishments where distillation is adopted were two in New York, one in Philadelphia, and one (just completed) in Cincinnati. Neither of them was upon a scale of any magnitude. At Baltimore I found ice being used largely in a manufactory were tallow candles were being made for the West Indian market. By these means the temperature (then 95° to 98° *in the shade*) was lowered sufficiently to consolidate the tallow in the moulds, which were arranged on a circular filling-frame, immersed and travelling round in a circular trough containing the ice and water. About 1½ tons of ice, costing $6 per ton, were consumed daily in the manufacture of 1250 lbs. of candles of from 6 to 18 to the lb. For soap-making, the refuse tallow, and also large quantities of the wash and trimmings of the hog trade of the Western States, were used, with resin, &c., and the *caustic* alkali made at Tarentum, near Pittsburg. Good firm soaps were manufactured, the lowest quality being sold at 5 c. per lb.

In conclusion, I have only to remark, that in reference to those machines, &c., in Class IX, which I have ventured to call attention to as worthy of notice in this country, I have merely described them as I found them being used in the States. In some cases alterations, which may be made advantageously, will probably at once suggest themselves; in others they may be necessary to suit the different conditions of the two countries.

JOHN WILSON.

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* See Mr. Wallace's Report, page 58.

APPENDIX.

APPENDIX.

APPENDIX A.—STATEMENT, SHOWING THE NUMBER AND CONDITION OF EACH SORT OF IRON WORKS IN EASTERN PENNSYLVANIA, IN 1850.

COUNTY.	Anthracite Blast Furnaces.				Charcoal Blast Furnaces.						No. of Bloomeries.	No. of Forges.	No. of Rolling Mills.	Total.
					Hot Blast.			Cold Blast.						
	Unfinished*	In.	Out.	Total.	In.	Out.	Total.	In.	Out.	Total.				
1. Adams	....	....	....	0	....	....	0	....	1	1	0	0	0	1
2. Blair	....	....	....	0	4	4	8	4	....	4	0	14	1	27
3. Bedford	...	....	....	0	....	2	2	....	1	1	0	3	0	6
4. Berks	....	1	....	1	4	....	4	6	2	8	0	23	5	41
5. Bucks	1	1	....	2	....	....	0	....	....	0	0	0	0	2
6. Bradford	....	....	....	0	....	....	0	....	....	0	0	0	0	0
7. Carbon	....	1	1	2	1	1	2	....	....	0	4	2	0	10
8. Cumberland	....	....	....	0	1	1	2	....	5	5	0	4	1	12
9. Columbia	....	5	6	11	2	2	4	1	....	1	0	1	3	20
10. Chester	....	1	2	3	....	....	0	2	....	2	0	6	14	25
11. Centre	....	....	....	0	1	1	2	4	4	8	0	5	5	20
12. Clearfield	....	....	....	0	....	1	1	....	....	0	0	0	0	1
13. Clinton	....	....	....	0	1	2	3	....	2	2	0	1	0	6
14. Dauphin	....	....	2	2	1	1	2	2	....	2	0	2	1	9
15. Delaware	....	....	....	0	....	....	0	....	....	0	0	0	1	1
16. Franklin	....	....	....	0	2	....	2	1	5	6	0	8	1	17
17. Huntingdon	....	....	....	0	6	3	9	3	3	6	0	11	2	28
18. Juniata	....	....	....	0	....	....	0	....	....	0	0	0	0	0
19. Lehigh	....	6	1	7	....	1	1	....	1	1	0	0	0	9
20. Lycoming	....	....	....	0	....	1	1	1	1	2	0	3	2	8
21. Luzerne	....	2	2	4	1	....	1	....	....	0	0	1	2	8
22. Lebanon	1	1	1	3	....	....	0	2	1	3	0	3	0	9
23. Lancaster	1	5	3	9	3	2	5	1	1	2	0	12	2	30
24. Mifflin	....	....	....	0	....	4	4	....	1	1	0	2	0	7
25. Monroe	....	....	....	0	....	....	0	....	....	0	1	0	0	1
26. Montgomery	....	2	3	5	....	....	0	....	1	1	0	2	4	12
27. Northumberland	....	1	1	2	....	....	0	....	1	1	0	1	0	4
28. Northampton	1	2	1	4	....	....	0	....	....	0	1	0	1	6
29. Potter	....	....	....	0	....	....	0	....	....	0	0	0	0	0
30. Perry	....	....	....	0	....	3	3	....	2	2	0	1	1	7
31. Pike	....	....	....	0	....	....	0	....	....	0	0	0	0	0
32. Philadelphia	....	....	....	0	....	....	0	....	....	0	0	3	8	11
33. Susquehanna	....	....	....	0	....	....	0	....	...	0	0	0	0	0
34. Sullivan	....	....	....	0	....	....	0	....	....	0	0	0	0	0
35. Schuylkill	1	1	....	2	2	....	2	....	1	1	0	6	1	12
36. Tioga	....	....	....	0	1	....	1	....	....	0	0	0	1	2
37. Union	....	....	....	0	1	2	3	....	....	0	0	1	0	4
38. Wayne	....	....	....	0	....	....	0	....	....	0	0	0	0	0
39. Wyoming	....	....	....	0	....	....	0	....	....	0	0	0	0	0
40. York	....	....	....	0	....	5	5	....	....	0	0	3	0	8
	5	29	23	57	31	36	67	27	33	60	6	118	56	364

* On two of these furnaces the work has been suspended over a year. On two others the work will be completed, but they will not be blown in. The remaining furnace will be completed and blown in, as it is to take the place of another one worn out.

Appendix B.—Detailed Statement of all the Anthracite Blast Furnaces in the State of Pennsylvania, in 1850.

COUNTY.	Number of Furnaces.			Date of Construction	Name of Works.	Situation of Post Office.	Kind of Ore used.*	Number of Men and Boys Employed.	Number of Oxen, Horses and Mules Employed.	BLAST.				STACK.		Kind of Power used, and Number.	Kind of Metal made, and Number.	Annual Capacity.
	Un-finished.	In Blast.	Out of Blast.							Heat.	Tuyeres.		Pressure.	Bosh.	Height.			
										°	No.	Diameter.		Feet.	Feet.			Tons.
Berks	..	1	..	1840	Henry Clay	Reading	H. M.	50	35	500	3	3	3 to 4	14	37	Steam	1	3,500
Bucks	1	1	..	1848	Durham	Durham	H. M.	168	32	500	3	3	3	18	40	”	2, 3	8,000
Columbia	..	..	1	1838†	Montour 1	Danville	F.	70	5	612	3	2½	4	9	31	”	3	3,150
do.	..	..	1	1839	do. 2	do.	F.	70	5	”	3	”	4½	12	33	”	3	4,100
do.	..	1	..	1839	do. 3	do.	F.	70	5	”	3	”	”	”	”	”	3	4,100
do.	..	1	..	1845	do. 4	do.	F.	70	5	”	4	”	4½	14	34	”	3	6,500
do.	..	..	1	1846	Franklin	do.	F.	45	25	”	3	4	2	8	30	”	2, 3	2,000
do.	..	..	1	1840	Roaring Creek	do.	F.	45	45	”	3	3	3	8½	32	Water	1, 2	2,000
do.	..	1	..	1840	Columbia	do.	F.	50	20	”	3	2½	5	8½	30	Steam	1, 2	2,500
do.	..	2	..	1845	Iron Dale	Bloomsburg	F.	180	80	550	3	3½	2½	14	35	Water	2, 3	10,200
do.	..	..	1	1845	Williamsburg	Light Street	F.	40	25	500	3	3	1½	8	30	”	2, 3	2,000
do.	..	..	1	1847	Light Street	do.	F.	40	20	”	3	2½	1½	9	32	”	2, 3	2,000
Carbon	..	1	..	1838	Carbon	Mauch Chunk	H. M.	53	8	”	3	3	3	8½	34	”	1, 2	2,000
do.	..	..	1	1826	Maunch Chunk	do.	H. M.	..	..	..	..	..	..	8	28	”	..	2,000
hester	..	..	1	1845	Phœnix 1	Phœnixville	H. M.	371	114	612	3	3	4	12	38	Steam	2, 3	4,100
do.	..	1	..	1845	do. 2	do.	H. M.			612	3	3	4	12	”	”	2, 3	4,100
do.	..	..	1	1847	do. 3	do.	H. M.			”	3	3	4	14	”	”	2, 3	5,000
Dauphin	..	..	1	1845	Harrisburgh	Harrisburg	H.	71	48	”	3	3¼	3¾	12	35	”	1, 2	3,800
do.	..	..	1	1834‡	Emeline	Dauphin	H.	30	7	”	3	2½	2½	8	”	S. & W.	”	2,000
Lehigh	..	..	1	1840	Crane 1	Catasauqua	H. M.	500	300	”	3	3	4	11	45	Water	”	4,000
do.	..	1	..	1842	do. 2	do.	H. M.		..	”	4	”	”	13	”	”	”	5,000
do.	..	1	..	1846	do. 3	do.	H. M.		..	”	6	”	”	17	”	Steam	”	7,200
do.	..	1	..	1850	do. 4	do.	H. M.	..	..	”	7	”	”	18	40	”	”	8,000
do.	..	1	..	1850	do. 5	do.	H. M.	..	..	”	7	”	”	18	”	”	”	8,000
do.	..	1	..	1846	Allentown 1	Allentown	H. M.	200	250	”	3	2½	2½ to 3	12	35	”	”	5,000
do.	..	1	..	1847	do. 2	do.	H. M.	..	..	”	3	”	2½ to 3	12	35	”	”	5,300
Luzerne	..	..	1	1842	Lackawanna 1	Scrantonia	F. C.	500	236	450	3	2½	2	11	33	Water	3	2,000
do.	..	1	..	1849	do. 2	do.	F. C.		..	”	3	3¼	2½	14	35	Steam	3	3,500
do.	..	1	..	1849	do. 3	do.	F. C.		..	”	3	3½	”	14	35	”	3	3,500
do.	..	..	1	1847	Jim Crack	Wilkesbarre	F.	50	20	”	3	2½	1	9	33	”	3	1,500
Lebanon	..	..	1	1847	Lebanon 1	Lebanon	M.	213	100	”	3	4	4	14	35	”	1, 2, 3	6,000
do.	..	1	..	1848	do. 2	do.	M.		..	”	3	5	4	12	35	”	”	5,000
do.	1	..	..	1850	Cornwall	Cornwall	M.	..	..	”	3	4	..	12	38	”	”	5,000
Lancaster	..	1	..	1848	Safe Harbour	Safe Harbour	H.	100	34	”	6	3¼	3½	14	45	”	3	5,000
do.	..	..	1	1844	Shawnee	Columbia	H.	28	60	”	2	4	..	8	28	”	1, 2	2,000
do.	..	1	..	1848	Cordelia	do.	H.	28	71	612	3	3	..	8½	31	”	”	2,000
do.	..	..	1	1841§	Sarah Ann	do.	H.	24	30	”	3	3	3½	8	30	”	”	2,000
do.	..	1	..	1845	Henry Clay	do.	H.	50	36	”	3	3½	2½	9	35	”	”	2,800
do.	..	1	..	1846	Chickiswalungo	do.	H.	45	40	”	3	3	2½	8	32	”	1, 2, 3	2,500
do.	..	..	1	1847	Donegal	do.	H.	46	44	”	3	3	4	10	35	”	”	3,800
do.	..	1	..	1849	Marietta	do.	H.	58	45	”	3	3½	3½	10	33	”	”	3,800
do.	1	..	..	1850	do.	do.	H.	..	..	”	3	”	”	10	33	”	”	3,800
Montgomery	..	1	..	1845	Plymouth	Conshohocken	H.	185	40	”	3	3	3	11	36	”	1, 2	3,250
do.	..	1	..	1848	Merion	do.	H.	120	40	”	3	3	3½	14	38	”	”	3,500
do.	..	..	1	1844	Spring Mill	do.	H.	100	40	”	3	3	4	12	40	”	3, 4	4,000
do.	..	..	1	1850	Swede	Philadelphia	H.	110	30	”	6	2½	4	14	42	”	1, 2	4,000
do.	..	..	1	1845	William Penn	Conshohocken	H.	95	42	”	6	2½	2½	13	33	”	”	3,500
Northumberland	..	1	..	1846	Chulasky	Chulasky	F.	65	50	”	3	4	3½	14	34	”	2, 3	4,500
do.	..	..	1	1842	Shamokin	Shamokin	C. B. F.	40	25	”	3	3	4½	12	45	”	1, 2	3,500
Northampton	..	1	..	1842	S. Easton	Easton	H. M.	50	20	”	3	2½	3½	11	37	Water	”	3,500
do.	..	..	1	1844	Glendon 1	do.	H. M.	200	90	500	3	3	3	10	45	”	1, 2, 3	4,000
do.	..	1	..	1845	do. 2	do.	H. M.		..	”	4	”	”	12	45	”	”	6,300
do.	1	..	..	1850	do. 3	do.	H. M.	..	..	”	5	”	”	12	35	Steam	”	6,300
Schuylkill	..	1	..	1838	Pioneer	Pottsville	H. C.	60	25	612	3	3	4	9	34	”	1	2,000
do.	1	..	..	..	St. Clair	St. Clair	C.	..	..	”	3	..	..	14	32	”	1, 2	3,500
	5	29	23					4,225	2,126									221,400

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* In the column of Ores, H. signifies Brown Hematite; M., Magnetic; F., Fossilliferous Red Oxyde; C., Carbonate; B., Bog Ore.

† Altered from Charcoal, 1839.

‡ Altered from Charcoal, 1848.

§ Altered from Charcoal, 1845.

APPENDIX C.—DETAILED STATEMENT OF ALL THE HOT BLAST CHARCOAL FURNACES IN EASTERN PENNSYLVANIA, IN 1850.

COUNTY.	No. of Furnaces.		Date of construction.	NAME OF WORKS.	SITUATION. POST OFFICE.	Kind of Ores used.	No. of men and boys employed.	No. of oxen, horses, and mules employed.	BLAST.				STACK.		Kind of Power used.	Kind of Metal made. No.	Market for sales.	Capacity.
	In Blast.	Out Blast.							Heat.	Tuyeres. No.	Tuyeres. Diam.	Pressure.	Bosh. feet.	Height feet.				Tons.
Blair	....	1	1836	Elizabeth	Frankstown	F.	100	25	Hot.	2	....	....	8½	32	W.&S.	3	W.	1,600
do.	1	....	1815	Springfield	Springfield Furnace	F. & H.	80	50	,,	2	....	....	8	30	Water	3	....	1,820
do.	....	1	1846	Gap	E. Freedom	F. & H.	45	43	,,	1	2½	....	8½	32	,,	3	....	1,600
do.	1	....	1811	Alleghany	Hollidaysburg	H.	80	60	,,	2	2½	....	9	32	,,	1, 2, 3	....	1,800
do.	1	....	1846	Blair	Collinsville	F. & ½ H.	76	27	,,	2	2½	....	8	36	Steam	3	W. & H.	1,400
do.	....	1	1832	Elizabeth	Antestown	H.	50	20	,,	2	2½	....	8½	34	Water	3	W.	1,600
do.	1	....	1805	Ætna	Yellow Spring	F. H.	100	38	,,	1	2¼	....	8	31	,,	3	....	1,400
do.	....	1	1837	Canoe	Williamsburg	H.	....	....	,,	2	2¼	....	8	31	Steam	3	....	1,400
Bedford	....	1	1800	Hopewell	Hopewell	F.	50	20	,,	1	....	....	7	32	Water	3	E. & W.	1,000
do.	....	1	1846	Hanover	McConnelsburg	H.	50	25	,,	2	2½	....	7	30	,,	....	H.	1,000
Berks	1	....	1777	Reading	Furnace	M.	100	80	,,	2	2	1½	9	30	,,	2, 3	....	2,200
do.	1	....	1846	Hampton	Hampton	M.	50	30	,,	2	2¾	1	7½	30	,,	2, 3	....	1,200
do.	1	....	1836	Alsace	Reading	H.	40	40	,,	1	2	....	7½	30	,,	1, 2, 3	....	1,550
do.	1	....	1820	Windsor	Mohrsville	H.	50	50	,,	2	3	....	7½	30	,,	....	....	1,200
Carbon....	1	....	1834	Maria	Lehighton, 2 m.	H.	153	58	600°	1	....	3	8	30	,,	1	....	2,060
do.	....	1	1837	Pennsville	E. Penn	H.	61	55	500°	1	2¼	....	7	30	,,	1	....	1,000
Cumberland	1	....	1770	Pine Grove	Carlisle	H.	61	41	Warm.	2	2½	....	8	33	,,	1	....	1,600
do.	....	1	1795	Holley	Papertown	M. & H.	70	40	,,	2	2½	....	8	33	,,	2, 3	....	1,400
Columbia	....	1	1839	Liberty	Mooresburg	F.	80	30	Hot.	2	2½	....	8	30	Steam	1, 2	....	1,400
do.	1	....	1836	Esther	Catawissa, 3½	F.	60	50	,,	2	2½	....	7½	30	Water	2, 3	....	1,600
do.	1	....	1845	Penn	Catawissa, ¾	F.	70	69	,,	2	3	....	7½	29	,,	2, 3	....	1,200
do.	....	1	1837	Briar Creek	Berwick, 2	F.	30	15	,,	2	2¼ & 2¾	....	7	27	,,	2, 3	....	1,000
Centre	1	....	1790	Centre	Bolesberry	H.	75	50	,,	2	3	....	8	30	,,	3	....	1,400
do.	....	1	1826	Hecla	Zion	H.	60	18	,,	1	2½	....	8	30	,,	3	....	1,400
Clearfield	....	1	1815	Karthaus*	K.	C.	120	20	400°	3	2½	2	12	45	,,	3	....	2,000
Clinton	1	....	1830	Mill Hall	Mill Hall	H.	70	45	Hot.	2	4	....	8½	28	,,	2, 3	....	1,600
do.	....	1	1811	Washington	Kittany	H.	70	45	,,	1	....	....	8	30	,,	2, 3	....	1,400
do.	....	1	1834	Farrandsville*	Farrandsville	F.	70	25	,,	2	....	....	10	45	,,	2, 3	....	2,000
Dauphin	....	1	1830	Victoria	Dauphin	H.	90	80	,,	2	2½ & 3	....	9	45	,,	1, 2	....	2,200
do.	1	....	1837	Manada	W. Hanover	M.	100	70	600°	2	2¼	1¾	8¼	32	,,	3	....	2,215
Franklin ...	1	....	1805	Montalto	Montalto	H.	150	30	Hot.	2	2½ a 3	....	9	33	,,	2, 3	....	1,800
do.	1	....	1837	Caledonia	Grafenbur	H.	80	34	,,	2	2 a 3	....	8	33	,,	....	....	1,400
Huntingdon	1	....	1844	Monroe	Pine Grove, Centre Co.	H. & F.	60	30	,,	2	2	....	9	33	,,	1, 2, 3	....	1,800
do.	1	....	1838	Mill Creek	Mill Creek	⅔ H. & ⅓ F.	70	40	,,	1	2¾	....	8	30	,,	3	E. & W.	1,400
Carried forward	19	15					2,471	1,353										52,645

* Built for a coke furnace.

APPENDIX C. (*continued.*)—DETAILED STATEMENT OF ALL THE HOT BLAST CHARCOAL FURNACES IN EASTERN PENNSYLVANIA, IN 1850.

COUNTY.	No. of Furnaces. In Blast.	No. of Furnaces. Out Blast.	Date of construction.	NAME OF WORKS.	SITUATION. POST OFFICE.	Kind of Ores used.	No. of men and boys employed.	No. of oxen, horses, and mules employed.	BLAST. Heat.	BLAST. Tuyeres. No.	BLAST. Tuyeres. Diam.	BLAST. Pressure.	STACK. Bosh. feet.	STACK. Height feet.	Kind of Power used.	Kind of Metal made. No.	Market for sales.	Capacity. Tons.
Brought forward	19	15					2,471	1,353										52,645
Huntingdon	1		1816	Union	Spruce Cr.	H.	60	25	Hot.	1	2½	....	8	30	Water	2, 3	E. & W.	1,400
do.	....	1	1796	Huntingdon	Warrior's Mark	H.	130	50	,,	1	2½	....	8½	33	,,	3	W.	1,650
do.	1	....	1839	Edward	Vineyard Mills	F. & H.	50	36	,,	2	2	....	8½	32	,,	2, 3	W.	1,600
do.	....	1	1832	Winchester	Orbisonia	H.	40	30	,,	1	2½	....	8	28	,,	2, 3	W.	1,400
do.	1	....	1830	Rockhill	,,	F. & H.	40	34	,,	2	2½	....	8	30	,,	3	E.	1,400
do.	....	1	1837	Chester	,,	H.	80	24	,,	2	....	....	9	45	S.&W.	2, 3	E.	1,800
do.	1	....	1849	Rough and Ready	Coffee Run	F. & ½ H.	48	27	,,	2	2½	....	9	32	Water	3	E.	1,800
Lehigh	....	1	1826	Lehigh	N. Whitehall	H.	90	60	500°	1	2¾	....	7½	31	,,	1	....	1,200
Lycoming ..	....	1	1837	Ralston	Ralston	C.	44	37	600°	3	3¼	....	10	35	,,	2	....	2,000
Luzerne	1	....	1846	Shickshinny	Shickshinny	F.	62	24	Hot.	2	2	....	9	30	,,	1, 2	....	1,800
Lancaster	1	....	1756	Elizabeth	Brickerville	M.	60	50	460°	2	1½	1	9	29	S.&W.	1, 2, 3	....	1,900
do.	1	1	1832	Rock*	Peningtonville	H.	100	90	,,	2	2	1½	8½	29	,,	1, 2, 3	....	1,200
do.		1	1800	Mount Vernon	Elizabethtown	M.	100	30	....	2	2¼	....	8	32	,,	2, 3	....	1,400
do.	1	....	1809	Conowingo	Buck	H.	100	75	212°	1	3	....	7½	30	,,	1, 2	....	1,200
Mifflin	....	1	1846	Isabella	Lewistown	F. & H.	55	40	Hot.	2	2¾	....	9	30	,,	1, 2	E.	1,800
do.	....	1	1810	Hope	Lewistown, 6 m.	F. & H.	55	30	,,	2	2½	....	8½	31	,,	....	....	1,600
do.	...	1	1838	Brookland	Waynesburg	H.	100	40	,,	2	3	....	8	32	,,	2, 3	E.	1,400
do.	....	1	1838	Matilda	Jackstown P. O. Huntingdon Co.	F.	60	30	,,	2	2½	....	8	33	Steam	1, 2	E.	1,400
Perry	....	1	1840	Perry†	Bloomfield	F. & H.	40	35	,,	1	....	....	7	....	Water	1, 2	....	1,000
do.	....	1	1808	Juniata	Newport, 3 m.	F. & H.	50	30	,,	2	....	....	8	....	,,	1, 2	....	1,400
do.	....	1	1836	Montebello	Duncannon	F.	70	35	,,	2	1½	....	8½	32	,,	2, 3	....	1,600
Schuylkill ...	1	....	1830	Swatara‡	Pine Grove, 6 m.	M.	103	33	Cold.	2	2¼	....	9	32	,,	1, 2	....	1,880
do.	1	....	1835	Stanhope	Pine Grove, 2 m.	H.	65	88	Hot.	1	2¼	....	7½	30	,,	1, 2	....	1,200
Tioga	1	....	1841	Blossburg	Blossburg	F. C. B.	40	16	400°	1	4	....	7½	31	,,	1, 2	....	1,200
Union	....	1	1827	Berlin	Hartleytown, 4 m.	F.	60	30	Hot.	2	....	....	8	31	,,	2, 3	....	1,400
do.	....	1	1846	Forest	Milton, 6 m.	F.	36	20	,,	2	....	....	9	30	,,	1, 2	....	1,800
do.	1	....	1848	Beaver	Middleburg	F.	50	36	,,	2	2¾	....	8½	30	,,	1, 2	....	1,600
York	....	1	1823	Margaretta	Margaretta	H.	100	30	,,	2	2 & 3	....	7	32	Steam	1, 2	....	1,200
do.	....	1	1827	Manor	Chanceford	H.	80	40	,,	1	2	....	8	32	Water	1, 2	....	1,400
do.	....	1	1830	York	Chanceford	H.	80	30	,,	2	2½	....	9	32	,,	1, 2	....	1,800
do.	....	1	1836	Codorus	Manchester	H.	100	30	,,	2	3	....	8	32	,,	1, 2	....	1,400
do.	....	1	1842	Wookstock	Margaretta	H.	75	20	,,	2	....	....	10	40	,,	....	....	2,000
Total....	31	36					4,694	2,499										101,475

* Now running cold blast. † Abandoned. ‡ Blast now running cold; have a hot.

APPENDIX D.—DETAILED STATEMENT OF ALL THE COLD BLAST CHARCOAL FURNACES IN EASTERN PENNSYLVANIA, IN 1850.

COUNTY.	No. of Furnaces.		Date of Construction.	Name of Works.	Situation of Post Office.	Kind of Ores used.	Number of Men and Boys Employed.	Number of oxen, horses, and mules employed.	BLAST.				STACK.		Kind of Power used.	Kind of Metal made.	Market for Sales.	Capacity.
	In Blast.	Out of Blast.							Cold.	Tuyeres.		Pressure.	Bosh.	Height.				
										No.	Diameter.		Feet.	Feet.				Tons.
Adams	..	1	1830	Chestnut Grove	Whitestown	M.	56	35	Cold.	1	..	..	8	32	Water.	..	..	1,100
Blair	1	..	1824	Bald Eagle	Warrior's Mark, Huntingdon County	H.	118	40	„	1	2½	..	8½	34	„	3	W.	1,830
do.	1	..	1819	Rebecca	Martingsburg	H.	60	50	„	1	2½	..	8¼	32	„	3	W.	1,560
do.	1	..	1846	Bloomfield	Sarah	H.	75	32	„	1	2¼	..	8½	30	Steam.	3	W.	1,350
do.	1	..	1833	Sarah	„	H.	70	55	„	1	2½	..	8¼	32	Water.	3	W.	1,400
Bedford	..	1	1841	Lemnos	Hopewell.	½ F. & H.	74	30	„	1	2½	..	8½	30	Steam.	3	H. & W.	1,350
Berks	1	..	1759	Hopewell	Douglasville	M.	80	50	„	1	..	¾	6½	30	Water.	1	E.	1,150
do.	1	..	1816	Mossilm	Mossilm	H.	60	54	„	1	2	..	8·9	32	„	2, 3	E.	1,350
do.	1	..	1793	Joanna	Joanna	M.	50	30	„	1	..	..	7·6	31	„	2, 3	E.	1,050
do.	1	..	1827	Mount Penn	Reading, 4 miles	M.	100	64	„	1	2½	..	8	31	„	2, 3	E.	1,100
do.	1	..	1797	Mary Ann	Long Swamp	M. & H.	59	35	„	1	2½	..	7	30	„	1, 3	E.	1,000
do.	1	..	1791	Sally Ann	New Jerusalem	H.	60	40	„	1	2½	..	6	32	„	1, 2, 3	E.	850
do.	..	1	1835	Oley	Oley	M. & H.	60	35	„	1	..	¾	6½	28	„	1	E.	800
do.	..	1	before 1770	Old Oley	Pricetown	M. & H.	..	..	„	1	..	..	9	28	„	1	E.	1,400
Cumberland	..	1	1826	Mary Ann	Shippensburg	H.	80	25	„	1	2½	..	8	32	„	3	E.	1,100
do.	..	1	1828	Augusta	„	H.	80	25	„	1	2½	..	8	32	S. & W.	3	E.	1,100
do.	..	1	1815	Carlisle	Carlisle	H.	56	29	„	1	1¾	..	7½	25	Water.	2	E.	1,000
do.	..	1	1794	Cumberland	Dickinson	½ M. & H.	40	25	„	1	2	..	8½	30	„	2, 3	E.	1,350
do.	..	1	1836	Big Pond	Shippensburg	F. & H.	75	50	„	1	2½	..	7½	30	„	3	E.	1,000
Columbia	1	..	1815	Catawissa	Maineville	F.	53	50	„	1	3½	..	8½	32	„	1, 2	E.	1,350
Centre	..	1	1832	Martha	Martha Furnace Post Office.. ..	H.	70	60	„	1	2½	..	8	32	„	3	E.	1,180
do.	1	..	1848	Eagle	Milesburg	H.	80	45	„	2	2¼	..	8	30	„	3	E.	1,100
do.	1	..	1800	Logan	Bellefont	H.	40	36	„	1	3	¾	8	31	„	3	E.	1,320
do.	1	..	1816	Rock	Bellefont, 5 miles	H.	35	36	„	1	1¾	..	7	28	„	3	E.	900
do.	..	1	1828	Hannah	Centre Line	H.	100	40	„	1	2½	..	8½	33	„	3	W.	1,350
do.	..	1	1835	Juliana	Juliana	H.	60	30	„	1	2½	..	8½	33	„	3	E.	1,350
do.	1	1	1830	Howard	Howard	½ F. & H.	50	30	„	1	2½	..	8½	33	„	3	E:	1,400
Clinton	..	1	1834	Sugar Valley . ..	Loganville	H.	..	..	„	1	..	..	..	..	..	1	E.	800
do.	..	1	1831	Lamar..	Salona	H.	..	..	„	1	..	..	8	..	„	2, 3	E.	1,100
Chester	1	..	1835	Isabella	Rockville	M.	75	45	„	1	2¼	..	6½	33	„	2, 3	E.	1,000
do.	1	..	1736	Warwick	Pottstown	M.	100	50	„	1	2¼	..	7	33	„	2, 3	E.	1,400
Dauphin	1	..	1849	Middletown	Middletown	M.	70	42	„	1	2	..	6½	30	„	1	E.	800
do.	1	..	1833	„	„	M.	..	..	„	1	2	..	8½	..	„	1	E.	1,350
Franklin	1	..	1800	Carrick	Fannetsburg, 4 miles	H.	10	5	„	1	2½	..	7½	30	„	2, 3	H.	1,000
do.	..	1	1830	Southampton ..	Shippensburg, 3½ miles	H.	60	33	„	1	2	..	9½	30	„	1, 2, 3	E.	1,500
do.	..	1	1835	Mary	„ 4 miles	H.	60	33	„	1	2	..	9	30	„	1, 2, 3	E.	1,400
do.	..	1	1828	Franklin	St. Thomas, 4 miles	H.	..	..	„	1	1½	..	9	30	„	2, 3	H.	1,400
do.	..	1	1825	Valley	Louden, 2 miles	H.	15	6	„	1	1½	..	6	28	„	2, 3	H.	800
do.	..	1	1835	Warren	Sylvan	H.	35	6	„	1	1½	..	8	28	„	2	E.	1,100
Huntingdon	..	1	1846	Rebecca	Mc Elavey Fort Post Office	F.	40	28	„	1	1½	..	6½	27	„	3	E.	800
do.	1	..	1813	Pennsylvania ..	Baileysville	H.	120	50	„	1	2½	..	8½	35	„	3	W.	2,310
do.	1	..	1833	Greenwood	14 miles from Lewistown	H.	100	67	„	1	2½ 3	..	8½	32·4	„	2, 3	E.	1,200
do.	..	1	1846	Malinda	Orbisonia	H.	30	20	„	1	2½	..	6½	28	„	2, 3	E.	800
do.	1	..	1829	Paradise	Paradise Furnace	½ F. & ½ H.	35	24	„	2	2	..	7½	33	„	2, 3	E.	1,000
do.	..	1	1838	Jackson	Mc Elavey Fort	F.	30	18	„	1	2	..	6	20	„	3	E.	800
Lehigh	..	1	1800	Hampton	Lionsville	H.	46	26	„	1	2	..	9	32	„	2, 3	E.	800
Lycoming	1	..	1838	Heshbon	Newberry	H.	30	30	„	1	2	..	6·9	25	„	3	E. & H.	900
do.	..	1	1820	Pine Creek	Jersey Shore, 4 miles..	F.	60	36	„	1	2	..	8	30	„	1, 2	H.	1,100
Lancaster	1	..	1785	Mount Hope.. ..	Mount Hope	M.	57	48	„	1	2	..	6½	27	„	1, 2	E.	1,434
do.	..	1	1846	Lancaster	Lancaster	H.	16	4	„	2	2½	..	7½	33	Steam.	2, 3	E.	1,000
Lebanon	1	..	1745	Cornwall	Cornwall	M.	60	46	„	1	2	..	7½	30	S. & W.	1	E.	1,400
do.	1	..	1745	Colebrooke	Elizabethtown, Lancaster County ..	M.	60	60	„	1	2	..	9	30	Water.	1	E.	1,600
do.	..	1	1837	Monroe	Fredericksburg	M.	40	25	„	1	2	..	7	30	„	1	E.	900
Mifflin	..	1	1830	Marion	Perryville	H.	80	35	„	1	..	..	..	..	„	2, 3	E.	1,800
Montgomery.. ..	..	1	1836	Green Lane	Sumneytown	H.	50	18	„	1	2½	..	7·4	33	„	2, 3	E.	900
Northumberland ..	..	1	1847	Paxinas	Paxinas	F.	35	12	„	2	2½	..	8	30	„	3	E.	1,100
Perry	..	1	1833	Caroline	Bailysburg	F.	40	10	„	1	2½	..	9	25	Steam.	3	E.	1,400
do.	..	1	1830	Oak Grove	Landisburg	F. & H.	50	12	„	1	..	..	8	..	Water.	1	E.	1,100
Schuylkill	..	1	1840	Jefferson	Schuylkill Haven	M.	40	15	„	1	..	..	6½	..	„	..	..	800
	27	33					3,185	1,830										69,524

APPENDIX E.—DETAILED STATEMENT of all the BLOOMERY FORGES in EASTERN PENNSYLVANIA, in 1850.

COUNTY.	Date of Construction.	Name of Works.	Situation. Post Office.	Kind of Power employed.	No. of Bloomery Fires.	No. of Hammers.	Form in which Iron leaves the Works.	No. of men and boys employed.	No. of horses, mules, and oxen employed.	Market.
Carbon	1830	Maria	Lehighton	Water	2	1	Bars	6	2	Home.
do.	1848	Pine Run	do. 5	,,	1	1	,,	25	12	,,
do.	1820	Ashland	Lehigh Gap 7	,,	2	1	,,	12	8	,,
do.	1843	Anthony's	do. 7½	,,	2	1	,,	12	4	,,
Monroe	1829	Analomink	Stroudsburg	,,	3	2	,,	30	12	,,
Northampton	1805	Jacobsburg	Jacobsburg	,,	2	1	,,	12	2	,,
					12	7		97	40	

These six works all use the rich Magnetic Ores from New Jersey, and consume about 3 tons of ore and 15 cords of wood to the ton of bars produced. The average annual capacity is 50 tons per fire, which, for the 12 fires in the State, would give 600 tons of bars, consuming 9,000 cords of wood and 1,800 tons of ore.

APPENDIX F.—DETAILED STATEMENT of the FORGES in EASTERN PENNSYLVANIA, in 1850, not properly belonging to either of the other classes.

COUNTY.	Date of Construction.	Name of Works.	Situation. Post Office.	No. of Puddling Furnaces.	No. of Heating Furnaces.	No. of Forge Fires.	Consumed.						No. of Furnaces running in 1850.		Men and boys employed.	Horses, mules, and oxen employed.	Description of Iron made.	Kind of Power employed.	Capacity.
							Bituminous Coal.	Anthracite Coal.	Wood.	Pig.	Bloom.	Scrap.	Pud-dling.	Heating.					
							Tons.	Tons.	Cords.	Tons.	Tons.	Tons.							
Berks ...	1846	Reading	Reading	....	2	....	....	1,000	....	....	450	....	....	....	14	3	Axles	Steam	600
Cumberland...	1848	Holley	Papertown	2	1	....	....	800	....	1,000	....	....	....	....	25	6	Blooms	,,	800
Philadelphia....	1849	Kensington	Kensington	....	1	....	600	....	....	....	500	100	....	1	7	1	Steel-plates	,,	1,000
,,	1850	Oxford	Frankford	....	....	3	....	....	1,500	....	....	1,000	....	....	13	2	Saw-plates	,,	600
				2	4	3	600	1,800	1,500	1,000	950	1,100	....	1	59	12			3,000

APPENDIX G.—DETAILED STATEMENT OF THE CHARCOAL FORGES IN EASTERN PENNSYLVANIA IN 1850.

COUNTY.	Kind of Power used.	Date of construction.	Name of Works.	Situation. Post Office.	Number of forge fires.	Number of Hammers.	Number of men and boys employed.	Number of oxen, horses & mules employed.	Markets.*	Run out fires.
Bedford ...	Water	1800	Hopewell	Hopewell	4	2	30	15	H. & E.	1
do.	,,	1808	Lemnos	,, ...	4	2	39	12	,,	1
do.	,,	1813	Bedford	,, ...	5	2	45	20	H. & W.	...
Berks	,,	1788	Rockland	New Jerusalem ...	1	1	8	3	H.	...
do.	,,	1803	Dale	Dale	3	2	16	11	,,	...
do.	,,	1799	Mount Pleasant ...	,, ...	2	1	14	8	,,	...
do.	,,	1837	Franklin	Reading	2	1	14	8	,,	...
do.	,,	1770	Green Tree ...	,, ...	2	1	18	10	,,	...
do.	,,	1836	Exeter	,, ...	2	1	20	12	,,	...
do.	,,	1830	Bloom	Dale	2	1	15	5	,,	...
do.	,,	1797	District	Pike Township ...	2	1	16	6	E.	...
do.	,,	1780	Birdsboro	Birdsboro	3	1	20	6	H.	...
do.	,,	1780	Oley Forge ...	Oley Township ...	2	1	20	12	H. & E.	...
do.	,,	1825	Dowell	Robeson	2	2	20	12	,,	...
do.	,,	1749	Charming	Furnace	5	2	50	20	E.	1
do.	,,	1830	Northkill	Schattlesville ...	2	1	30	12	,,	...
do.	,,	1840	Mount Airy ...	,, ...	2	1	30	11	,,	...
do.	,,	1809	Speedwell	,, ...	2	1	20	6	H. & E.	...
do.	,,	1825	,, ...	,, ...	2	1	20	6	,,	...
do.	,,	1790	Rockland	Rockland Township	2	1	16	6	H.	...
do.	,,	1795	Spring	Earl ,,	3	2	15	5	,,	...
do.	,,	1800	Distridt	Pike ,,	2	1	16	4	,,	...
do.	,,	1814	Union	Albany ,,	2	2	10	8	,,	...
do.	,,	1864	Gibraltar	Robeson ,,	4	2	26	18	,,	...
do.	,,	1882	Maiden Creek ...	Hamburg	2	1	16	11	,,	...
Blair	,,	1833	Antes	Birmingham ...	3	1	30	18	E. & W.	...
do.	,,	1833	Cold Spring ...	,, ...	3	1	25	20	W.	1
do.	,,	1813, 1804	Tyrone, 2 forges ...	,, ...	12	8	60	30	,,	...
do.	,,	1828	Franklin	Williamsburg ...	4	1	30	15	,,	1
do.	,,	1805	Ætna	Yellow Springs ...	4	1	30	6	,,	1
do.	,,	1810	Cove	Williamsburg ...	3	1	30	22	,,	1
do.	Steam	1839	Portage	Duncansville ...	3	1	10	2	E. & W.	...
do.	Water	1816	Maria, 3 forges ...	,, ...	13	3	60	50	W.	1
do.	,,	1836	Alleghany ...	,, ...	4	1	75	16	,,	1
do.	,,	1837	Gap	East Freedom ...	5	1	35	26	,,	1
do.	,,	1830	Mary Ann ...	Antestown ...	4	2	20	14	,,	1
Carbon	,,	1820	Ashland	Lehigh Gap ...	2	1	12	7	H.	...
do.	,,	1828	Pennsville ...	East Penn	4	2	24	4	,,	...
Centre	,,	1795	Bellefonte	Bellefonte	5	1	21	18	,,	...
do.	,,	1792	Rock	,, ...	4	2	15	6	E.	...
do.	,,	1800	Milesburg	Milesburg	5	1	30	24	H.	1
do.	,,	1811	Eagle	,, ...	7	1	21	8	,,	1
do.	,,	1840	Howard	Howard	2	1	10	6	,,	...
Chester ...	,,	1847	Greenwood ...	Penningtonville ...	3	1	20	12	,,	...
do.	,,	1792	Hibernia	Wagontown ...	3	1	16	18	,,	...
do.	,,	1806	Pleasant Garden ...	N. London ⋈ Roads	4	1	30	12	,,	...
do.	,,	1785	Mary Ann	Downingtown ...	3	2	22	12	,,	...
do.	,,	1750	Coventry	Pottstown ...	3	1	18	6	,,	...
do.	,,	1790	Springton	Brandywine Maner	3	2	20	10	,,	...
Clinton ...	,,	1837	Washington ...	Nittany	4	3	30	6	E.	...
Columbia ...	,,	1824	Catawissa	Mainville	3	2	25	6	H.	...
Cumberland ...	,,	1830	Laurel	Carlisle	5	2	45	13	H. & E.	1
do. ...	,,	1811	Carlisle	,, ...	4	2	36	4	H.	...
do. ...	,,	1790	Liberty	Lisburn	5	2	25	13	E.	...
Dauphin ...	,,	1830	Oakdale	Elizabethville ...	3	2	25	12	H.	...
do.	,,	1850		Dauphin	3	1	20	8	,,	...
Franklin ...	,,	1846	Carrick	Fannettsburg ...	2	1	10	5	,,	1
do.	,,	1790	Soundwell ...	Roxbury	3	2	10	6	,,	...
do.	,,	1834	Northeast	Louden	2	1	13	4	,,	1
do.	,,	1804	Valley	,, ...	2	1	15	6	,,	1
do.	,,	1832	Warren	Sylvan	3	1	15	4	H. & E.	1
do.	W. & S.	1805	Montalto, 2 forges	Montalto	7	2	150	30	H.	1
do.	Water	1830	Caledonia	Grafenburg ...	4	3	28	6	H. & E.	1
Huntingdon ...	,,	1837	Juniata	Alexandria ...	4	1	20	8	H.	2
do. ...	,,	1800	Barre	,, ...	6	2	40	18	E. & W.	1
do. ...	S. & W.	1832	Savage	Paradise	3	2	50	20	,,	2
do. ...	Water	1842	Malinda	Orbisonia	4	2	20	12	E.	...
do. ...	,,	1804	Juniata	Shaver's Creek ...	6	1	30	14	W.	1
do. ...	,,	1830	Rebecca	MdElavey Fort P.O.	3	1	27	10	E.	...
do. ...	,,	1805, 1809	Coleraine, 2 forges	Coleraine Forge ...	7	3	45	30	W.	...
do. ...	,,	1826	Elizabeth	,, P. O. ...	2	1	20	12	,,	...
do. ...	,,	1831	"	Water Street ...	3	1	20	12	,,	1
do. ...	,,	1836	Stockdale	Spruce Creek ...	2	1	10	7	,,	...
Lancaster ...	,,	1795	Brooke	Gap	3	1	30	8	E.	...
do. ...	,,	1725	Windsor	Churchtown ...	4	2	30	18	H.	...
do. ...	,,	1750	Poole	,, ...	3	2	25	12	E.	...
do. ...	,,	1793	Spring Grove ...	Goodville	4	2	29	18	,,	...
do. ...	,,	1750	Speedwell	Brickerville ...	3	1	30	12	H. & E.	...
do. ...	Steam	1850	Lancaster	Lancaster	2	1	8	2	,,	1
do. ...	Water	1828	Colemanville ...	,, ...	4	2	25	12	,,	1
do. ...	,,	1755	Martic	,, ...	3	1	40	20	,,	1
do. ...	,,	1830	White Rock ...	Oak Hill	3	2	25	12	,,	...
do. ...	,,	1838	Pine Grove ...	,, ...	3	2	20	18	,,	...
do. ...	,,	1810	Ringwood	Christiana	3	2	20	12	,,	...
do. ...	,,	1810	Sadsbury	,, ...	4	2	30	16	,,	...
Lebanon ...	,,	1845	Union	Jonestown ...	4	2	35	12	,,	...
do.	,,	1795	New Market ...	Anville	5	2	45	13	H.	...
do.	,,	1836	Monroe	Fredericksburg ...	3	1	40	12	H. & E.	...
Luzerne ...	,,	1824	Nescopeck ...	Berwick	4	2	25	12	H.	...
Lycoming ...	,,	1828	Heshbon	Newberry	2	1	20	12	,,	...
do.	,,	1830	Hepburn	Trout Run ...	3	2	15	4	,,	...
do.	,,	1831	Pine Creek ...	Jersey Shore ...	4	2	32	12	,,	...
Mifflin	,,	1810	Freedom	Lewistown ...	6	2	50	32	E.	...
do.	S. & W.	1838	Brookland ...	Weynesburg ...	6	1	45	12	,,	1
Montgomery ...	Water	1750	Glasgow	Pottstown ...	3	2	25	10	H.	...
do. ...	,,	1733	Green Lane ...	Sumneytown ..	3	2	30	9	H. & E.	...
Northumberland	,,	1844	Paxinas	Paxinas	2	1	20	6	,,	...
Perry	,,	1829	Fio	Duncannon ...	5	2	50	20	,,	...
Philadelphia ...	,,	1850	Flat Rock	Manayunk ...	3	1	25	10	H.	...
Schuylkill ...	,,	1801	Schuylkill	Port Clinton ...	5	2	35	12	H. & E.	...
do. ...	,,	1828	Susanna	,, ...	3	2	30	10		...
do. ...	,,	1816	Brunswick ...	,, ...	2	1	20	8	H.	...
do. ...	,,	1828	Hecla	,, ...	3	2	30	10	,,	...
do. ...	,,	1830	Mount Vernon ...	,, ...	2	1	20	8	,,	...
do. ...	,,	1826	Mount Hebron ...	Barry	3	2	50	25	,,	...
Union	,,	1827	Berlin	Hartleytown ...	4	2	50	20	E.	...
York	,,	1810	Castlefin	Castlefin	3	2	45	24	H. & E.	...
do.	,,	1770	Spring	Spring Forge ...	2	2	40	25	,,	...
do.	,,	1828	Woodstock ...	Margarettn ...	3	2	45	24	,,	...
					389	168	3,065	1,377		31

* In the column headed "Market," "E" means Philadelphia; "W" means Pittsburg; "H" means the home district, either at the works or to the country trade.

Appendix H.—Detailed Statement of all the Rolling Mills in Eastern Pennsylvania, in 1850.

COUNTY.	Date of Construction.	Name of Works.	Situation. Post Office.	No. of Puddlings Furnaces.	No. of Heating Furnaces.	No. of Train Rolls.	No. of Nail Machines.	Consumed.					No. of Furnaces running in 1850.		No. of men and boys employed.	No. of oxen, horses, and mules employed.	Description of Iron made.	Kind of Power used.	No. of run-out fires.	Market.
								Bituminous Coal. Bushels.	Anthracite Coal. Tons.	Pig. Tons.	Bloom. Tons.	Scrap. Tons.	Pud-dling.	Heating.						
Berks	1845	Bertolets	Reading	4	4	2	....	....	4,000	1,800	150	50	2	2	60	2	Sheets, bars, rods	Steam		E.
do.*	1836	Reading	,,	12	3	3	30	....	14,000	5,000	200	100	6	3	155	3	Bar, rods, nails, band and hoop	,,		,,
do.	1848	Birdsboro	Birdsboro	4	2	1	16	....	3,000	1,200	100	100	4	1	100	4	Nails	Water		,,
do.	1846	Gibraltar	Robeson Township	....	2	1	....	....	900	....	600	....	....	1	10	4	Boiler	,,		,,
do.	1845	Pine	Douglasville	....	2	1	....	25,000	....	....	850	....	....	2	18	6	,,	,,		,,
Blair	1839	Portage	Duncanville	4	4	3	18	115,000	....	1,700	100	50	4	2	50	18	Nails, plate, bar and rod	Steam	1	E. & W.
Centre	1825	Bellefonte	Bellefonte	1	2	3	....	25,000	....	500	600	....	1	1	16	18	Slit-rods, bars and axles	Water		E.
do.	1831	Milesburg	Milesburg	1	2	1	....	37,500	....	500	....	20	1	1	30	26	Slit-rods, bar, wire-billets	,,		,,
do.	1846	Hecla	Zion	2	1	1	....	20,000	....	500	....	....	....	....	16	12	Plate and sheet	Steam		,,
do.	1829	Eagle	Milesburg	1	1	1	....	17,500	....	500	....	....	1	1	10	6	Wire-billet and shovel-plate	Water		,,
do.	1840	Howard	Howard	3	1	1	....	30,000	....	1,250	....	....	3	1	18	3	Slit-rods and bars	,,		,,
Chester	1838	Triadelphia	Coatesville	1	4	2	....	30,000	....	150	450	20	1	2	20	4	Boiler and flue-iron	,,		,,
do.	1844	Pine Grove	Oakhill	....	2	1	....	12,000	....	....	400	....	....	1	9	4	,, ,,	,,		,,
do.	1845	Pleasant Garden	N. London Cross Roads	1	2	1	....	18,000	....	....	600	....	....	....	16	4	,, ,,	,,		,,
do.	1849	Summerfield	Pottstown	....	2	1	....	....	....	....	....	....	....	....	10	10	,, ,,	S. & W.		,,
do.	1830	Chester Co.	Phœnixville	7	2	1	40	....	4,000	2,200	100	100	7	2	70	2	Nails	Water		,,
do.	1836	W. Brandywine	Coatesville	....	4	2	....	30,000	....	....	1,000	....	....	4	30	14	Boiler and flue	,,		,,
do.	first built, 1790 rebuilt, 1835	Phœnix	Phœnixville	15	4	4	....	....	6,988	5,785	....	....	....	....	130	15	Bar and sheet	S. & W.		,,
do.	1846	Phœnixa Rl Mill	,,	25	6	2	....	....	20,656	12,105	....	....	13	3	307		R. R. Iron	Steam		,,
do.	1837	Hibernia	Wagontown	....	2	1	....	14,000	20	....	400	....	....	1	16	....	Boiler and flue	Water		,,
do.	1810	Brandywine	Coatesville	....	2	1	....	21,000	50	....	944	....	....	2	17	4	,, ,,	,,		,,
do.	1825	Laurel	,,	1	2	1	....	20,000	50	....	854	....	....	2	18	10	,, ,,	,,		,,
do.	1847	Thorndale	Downingtown	2	4	1	....	35,000	....	200	725	....	1	4	32	....	,, ,,	Steam		,,
do.	1795	Rokeby	Coatesville	....	3	1	....	50,000	50	....	875	....	....	....	22	10	,, ,,	Water		,,
do.	1840	Caln	,,	2	3	2	....	50,000	50	800	800	....	....	....	42	4	,, and rod	,,		,,
Columbia	1846	Montour	Danville	30	8	2	....	....	19,466	9,807	....	....	30	8	250	8	Rails	Steam		,,
do.	1847	Rough and Ready	,,	4	2	2	....	2,000	3,000	1,050	....	50	4	2	62	2	Bar, rod	,,		,,
do.	1845	Danville	,,	3	....	2	...	....	1,081	803	....	....	....	....	28	1	Pud. bar	,,		H.
Cumberland	1831	Fairview	Harrisburg	5	3	3	36	90,000	....	1,800	50	....	5	3	75	30	Bar, rod, nails	Water		E. & H.
Dauphin	1836	Harrisburg	Harrisburg	....	2	1	....	13,000	500	....	400	25	....	2	14	1	Boiler	Steam		E.
Delaware	1808	Franklin	Chester	....	1	1	....	....	300	....	10	....	....	1	7	5	Spring-steel, 210; sheet-iron, 10	Water		,,
Franklin	1810	Montalto	Montalto	....	4	2	....	5,000	....	....	....	40	....	4	150	30	Bar and rods	,,	1	H.

APPENDIX H. (*continued.*)—DETAILED STATEMENT OF ALL THE ROLLING MILLS IN EASTERN PENNSYLVANIA, IN 1850.

COUNTY.	Date of Construction.	Name of Works.	Situation. Post Office.	No. of Puddling Furnaces.	No. of Heating Furnaces.	No. of Train Rolls.	No. of Nail Machines.	Consumed.					No. of Furnaces running in 1850.		No. of men and boys employed.	No. of oxen, horses, and mules employed.	Description of Iron made.	Kind of Power used.	No. of run-out fires.	Market.
								Bituminous Coal. Bushels.	Anthracite Coal. Tons.	Pig. Tons.	Bloom. Tons.	Scrap. Tons.	Pud-dling.	Heating.						
Huntingdon	1847	Juniata	Shaver's Creek	1	3	1	....	15,000	....	200	....	....	....	....	19	1	Boiler, sheet	Water	1	W.
do.	1838	,,	Alexandria	2	3	2	....	55,000	....	660	....	....	2	3	45	22	Boiler, sheet, bar	,,	1	E. H. W.
Lancaster	1848	Safe Harbour	Safe Harbour	24	6	2	....	175,000	5,996	7,805	....	....	16	4	375	20	Rails	Steam	....	E.
do.	1828	Colemanville	Lancaster	....	4	2	12	....	1,000	....	1,059	....	....	4	50	21	Boiler and flue Bar and slit-rod Steel	.... Water	....	,, E. & H. E.
Luzerne	1842	Wyoming	Wilkesbarre	12	10	5	20	....	6,500	3,800	....	....	....	....	250	10	Rails, bar, nails	Steam	....	,,
do.	1844	Lackawanna	Scrantonia	24	7	4	22	....	14,000	10,000	....	....	16	6	250	75	Rails	S. & W.	....	,,
Lycoming	1842	Heshbon	Newberry	1	1	1	....	17,500	....	125	300	....	1	1	7	2	Bars	Water	....	E. & H.
do.	1842	Crescent	Trout Run	2	1	2	7	30,000	....	350	....	20	1	1	20	6	Bars and nails	,,	....	H.
Montgomery .	1846	Pottsgrove	Pottstown	3	4	2	....	....	3,000	400	863	....	1	2	30	14	Boiler and rods	Steam	....	E.
do.	1846	Norristown	Norristown	10	3	3	....	....	6,100	3,250	50	150	10	3	125	3	Bars, band, and nail-plates	,,	....	,,
do.	1830	Conshohocken	Conshohocken	2	2	2	....	....	1,200	600	200	....	1	1	22	1	Imitation Russian sheet	Water	....	,,
do.	1790	Cheltenham	Philadelphia	....	3	1	....	25,000	....	....	600	....	....	1	25	14	Boiler and flue	,,	....	,,
Northampton.	1837	Lehigh	S. Easton	....	4	3	6	....	1,500	....	1,000	50	....	2	65		Wire	,,	....	,,
Philadelphia....	1845	Kensington	Kensington	10	3	3	....	....	5,000	2,500	250	250	10	3	75	4	Bars, rods	Steam	....	,,
do.	1840	,,	,,	....	2	2	....		500	....	1,300	....	....	1	8	2	Saw-plates, spring-steel	,,	....	,,
do. ...	1845	Penn	,,	....	4	2	....	....	1,250	....	200	1,80	....	2	28	4	Bars, boiler, slit-rod, spring-steel	,,	....	,,
do.	1846	Treaty	,,	5	3	2	....	....	3,000	1,750	....	....	....	....	75	2	Bars, rails	,,	....	,,
do.	1846	Fairmount	Spring Garden	7	2	3	....		7,000	3,416	787	180	....	....	105	4	Bar, rod, band	,,	....	,,
do.	1848	Fountain-Green	,,	2	2	2	....	7,000	300	350	....	50	....	....	20	6	Rod, spikes	,, ...	....	,,
do.	1820	Flat Rock	Manayunk	1	2	2	....	12,000	750	225	450	....	1	1	18	4	Boiler and flue	Water	....	,,
do.	1842	Oxford	Frankford		2	1	....	10,000	1,000	....	400	400	....	2	10	4	Spring and saw steel	Steam	....	,,
Perry	1838	Duncannon	Duncannon	10	5	5	45	120,000	3,000	4,000	50	300	10	3	200	25	Bar, plate, rod	Water	....	E. & H.
Tioga	Unfinished	Blossburg	Blossburg	1	1	1	....	....		....	....	....	....	....			Bars	Steam	....	H.
Schuylkill	1839	Franklin	Port Clinton	2	1	1	....	....	1,500	440	....	150	1	1	18	7	Bars	Water	....	E. & H.
				247	164	106	252	1,126,500	140,707	87,521	17,717	3,905	153	97	3,648	511			4	

Schall and Dewees, Norristown, 24

Total No. of Nail-machines in Eastern Pennsylvania, 276

* No. of bars made for market since June, 1848; now making nails and gas-tubes only.

APPENDIX I.—STATEMENT, showing the number and condition of each sort of IRON WORKS, in each County in WESTERN PENNSYLVANIA, in 1850

COUNTY.	FURNACES.												Forges.	Rolling Mills.	Total.
	Raw Bituminous Coal and Hot Blast.			Coke and Hot Blast.			Charcoal and Hot Blast.			Charcoal and Cold Blast.					
	In.	Out.	Total.	In.	Out.	Total.	In.	Out.	Total.	In.	Out.	Total.	Total No.	Total No.	Total No.
1. Alleghany	..	..	..	..	..	..	..	..	..	..	..	..	..	16	16
2. Armstrong	..	..	..	..	4	4	1	..	1	7	4	11	..	2	18
3. Beaver	..	..	..	..	..	..	.	..	..	..	..	..	..	..	..
4. Butler..	..	..	..	..	..	..	..	..	..	4	2	6	..	..	6
5. Cambria	..	..	..	..	..	..	1	1	2	3	1	4	..	..	6
6. Clarion	..	..	..	..	..	..	1	..	1	22	6	28	1	..	30
7. Crawford	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
8. Elk	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
9. Erie	..	..	..	..	..	..	..	..	..	..	1	1	..	..	1
10. Fayette	..	..	..	..	..	..	..	..	..	3	2	5	..	2	7
11. Forest..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
12. Greene	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
13. Indiana	..	..	..	..	..	..	2	..	2	..	2	2	1	..	5
14. Jefferson	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
15. Lawrence	..	..	..	..	..	..	1	..	1	..	1	1	..	2	4
16. McKean	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
17. Mercer	3	4	7	..	..	..	1	5	6	..	3	3	..	..	16
18. Somerset	..	..	..	..	..	..	..	1	1	..	2	2	1	..	4
19. Venango	..	..	..	..	..	..	1	1	2	8	10	18	..	1	21
20. Warren	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
21. Washington	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
22. Westmoreland	..	..	..	..	..	..	2	..	2	2	2	4	..	..	6
	3	4	7	0	4	4	10	8	18	49	36	85	3	23	140

22 Counties—13 Counties having Iron Works.

APPENDIX K.—DETAILED STATEMENT OF ALL THE CHARCOAL HOT-BLAST FURNACES IN WESTERN PENNSYLVANIA IN 1850.

County.	Number of furnaces.		Date of construction.	Name of Works.	Situation. Post Office.	Kind of ore used.	Number of men and boys employed.	Number of horses and mules employed.	Number of Tuyeres.	Diameter of Bosh.	Height.	Kind of Power used.	Kind of Metal and Number.	Capacity.
	In.	Out.												
										feet.	feet.			Tons.
Armstrong .. 1	1	..	1839	Buffalo	Worthington	C.	80	50	2	9	32	W. & S.	3	1,800
Cambria .. 2	1	..	1846	Ben's Creek	Johnstown	H.	90	35	2	9	30	Water	2, 3	1,800
„ ..	..	1	1846	Eliza	Ebensburg	H	90	45	2	9	30	„	3	1,800
Clarion .. 1	1	..	1833	Lucinda	Lucinda	C	80	45	1	7, 10	30	„	1, 2	1,450
Indiana .. 2	1	..	1842	Indiana	Armagh	H.	80	36	2	9	30	„	2, 3	1,800
„ ..	1	..	1846	Blacklick	„	„	80	46	1	8	30	„	2, 3	1,400
Lawrence .. 1	1	..	1848	Wilmington	Wilmington	C.	100	50	3	10	34	Steam	2, 3	2,000
Mercer .. 6	..	1	1846	Hamburg	Delaware Grove	„	75	30	2	10	38	„	1, 2	2,000
„ ..	..	1	1848	Harry of the West	Georgetown	„	80	50	3	9	40	„	2, 3	1,800
„ ..	1	..	1846	Mineral Ridge	„	„	75	33	2	8, 6	34	„	2, 3	1,600
„ ..	..	1	1846	Sandy No. 2	Pryon	„	50	30	2	8	..	Water	3	1,400
„ ..	..	1	1838	„ „ 1	„	„	50	30	2	7	..	„	3	1,000
„ ..	..	1	1846	Mazeppa	Mercer	„	60	35	2	7, 6	33	Steam	2. 3	1,000
Somerset .. 1	..	1	1812	Shade	Stoystown	C. H.	80	43	1	8	30	Water	2, 3	1,400
Venango .. 2	..	1	1845	Orleans	Franklin	C.	50	45	3	9	27, 6	„	2, 3	1,800
„ ..	1	..	1832	Rockland	Rockland	„	50	40	1	8, 6	28	Steam	2	1,600
Westmoreland 2	1	..	1847	Conemaugh	Armagh	H.	60	30	2	9	33	„	3	1,800
„	1	..	1846	Laurel Hill	West Fairfield	„	80	40	2	9	33	Water	3	1,800
	10	8					1,310	713						29,230

Total number of furnaces 18

APPENDIX L.—DETAILED STATEMENT of all the RAW BITUMINOUS COAL HOT-BLAST FURNACES in PENNSYLVANIA in 1850.

COUNTY.	No. of Furnaces		Date of construction.	Name of Works.	Situation. P. O.	Kind of Ore used.	No. of men and boys employed.	No. of oxen, horses, and mules employed.	BLAST.			STACK.		Kind of Power used.	Kind of Metal made, and No.	Capacity.
	In Blast.	Out of Blast.							Tuyeres. No.	Tuyeres. Diam.	Pressure.	Bosh.	Height.			
												feet.	feet.			
Mercer ..	..	1	1845	Middlesex	Middlesex	C.	80	30	2	3	..	10	37	Steam	1, 2	2,000
" ..	1	..	1846	Sharon	Sharon	C.	80	20	3	3	..	10	40	Steam	2, 3	2,000
" ..	1	..	1845	Clay	Clarksville	C.	75	30	2	3	2	8½	37	"	2, 3	1,600
" ..	1	..	1845	Shenango	Mercer	C.	60	25	2	3	2	8	36	W. & S.	2, 3	1,500
" ..	..	1	1846	Harriet	Greenville	C.	80	40	2	3	..	10	55	Steam	3	2,000
" ..	..	1	1846	Mary Ann	do.	C.	80	50	3	3	..	10	50	"	3	2,000
" ..	..	1	1847	Blanche	Sharon	C.	60	25	3	3	..	8	40	"	3	1,500
	3	4					515	220								

APPENDIX M.—DETAILED STATEMENT of all the COKE HOT-BLAST FURNACES in the STATE of PENNSYLVANIA in 1850.

COUNTY.	No. of Furnaces		Date of construction.	Name of Works.	Situation. P. O.	Ore.	Bushels of Coal consumed.	No. of men and boys employed.	No. of oxen, horses, and mules employed.	BLAST.		STACK.		Kind of Power used, and No.	Kind of Metal made, and No.	Capacity.
	In Blast.	Out of Blast.								Tuyeres. No.	Tuyeres. Diam.	Bosh.	Height.			
												feet.	feet.			
Armstrong ..	..	1	1840	Brady's Bend	Brady's Bend	C.	..	..	..	3	2½ *a* 3	11	40	Steam	2, 3	2,000
" ..	..	1	1841	"	"	C.	1,120,000	900	100	3	"	11	40	"	"	2,000
" ..	..	1	1843	"	"	C.	..	..	..	3	"	13	50	"	"	3,500
" ..	..	1	1846	"	"	C.	..	..	..	..	"	14	50	"	"	4,500
		4														12,000

APPENDIX N.—DETAILED STATEMENT OF ALL THE CHARCOAL COLD-BLAST FURNACES IN WESTERN PENNSYLVANIA IN 1850.

COUNTY.		Number of Furnaces.		Date of construction.	Name of Works.	Situation. Post Office.	Kind of Ore used.	Number of men & boys employed.	Number of horses & mules employed.	Number of Tuyeres	Stack.		Kind of Power used.	Kind of metal made.	Capacity.
		In Blast.	Out Blast.								Height. feet.	Bosh. feet.			
														No.	Tons.
Armstrong	11	...	1	1847	Rock	Apollo	H. C.	60	48	1	8	30	Steam	3	1,100
do.	...	...	1	1846	Buffalo	Worthington	C.	40	20	2	8	32	S. & W.	3	1,100
do.	...	1	...	1842	Red Bank	Red Bank	,,	100	70	2	9	32	Steam	3	1,900
do.	...	...	1	1847	Olney	Kittanning	,,	60	48	1	8	30	Water	3	1,100
do.	...	1	...	1845	Mahoning	,,	,,	83	52	2	9	...	,,	3	1,400
do.	...	...	1	1830	Alleghauy	,,	,,	45	23	1	8	...	Steam	3	1,100
do.	...	1	...	1846	American	,,	,,	57	38	2	8, 6	...	,,	3	1,350
do.	...	1	...	1845	Ore Hill	,,	,,	108	80	2	8	...	,,	3	1,610
do.	...	1	...	1845	Cowanshannock	,,	,,	36	34	1	8	...	Water	3	1,100
do.	...	1	...	1846	Phœnix	Glade Run	,,	75	50	1	8	30	,,	3	1,100
do.	...	1	...	1846	Pine Creek	Kittanning	,,	65	50	2	8, 4	32, 6	Steam	3	1,430
Butler	6	...	1	1848	Marion	Harrisville	,,	40	28	1	8	...	Water	2, 3	1,100
do.	...	...	1	1828	Slippery Rock	Slippery Rock	,,	47	29	1	8	...	,,	3	1,100
do.	...	1	...	1840	Hickory	,,	,,	50	26	1	8	...	,,	3	1,100
do.	...	1	...	1843	Maple	Maple Furnace	H. C.	80	60	1	9	31	Steam	2, 3	1,400
do.	...	1	...	1847	Kensington	Lawrenceburg	C.	80	50	2	9	...	,,	3	1,400
do.	...	1	...	1848	Winfield	Butler	,,	100	70	2	9	...	,,	3	1,400
Cambria	...	1	...	1845	Mill Creek	Johnstown	H.	80	38	1	8	30	Water	3	1,100
do.	...	1	...	1842	Cambria	,,	,,	90	45	2	8	30	Steam	3	1,300
do.	...	1	...	1846	Mount Vernon	,,	,,	90	45	1	8	30	,,	3	1,100
do.	...	...	1	1847	Ashland	Summit	C.	80	40	1	8	30	Water	3	1,100
Clarion	28	1	...	1845	Helen	Clarion	,,	100	70	2	9	32	Steam	3	1,500
do.	...	...	1	1828	Clarion	,,	,,	70	45	1	9	32	Water	3	1,400
do.	...	...	1	1845	Martha	,,	,,	70	45	2	9	32	Steam	3	1,400
do.	...	1	...	1844	Mary Ann	Shippenville	,,	50	30	1	8	30	Water	3	1,100
do.	...	1	...	1832	Shippenville	,,	,,	70	50	1	8, 6	32	,,	2, 3	1,350
do.	...	1	...	1844	Tippecanoe	,,	,,	65	46	1	8	32	S. & W.	3	1,100
do.	...	1	...	1844	Prospect	Callansburg	,,	60	41	1	7, 6	...	,,	3	1,000
do.	...	1	...	1842	Elk	Shippenvile	,,	60	34	1	7, 6	...	Water	3	1,000
do.	...	1	...	1844	St. Charles	Leatherwood	,,	81	48	2	9	...	S. & W.	2, 3	1,400
do.	...	...	1	1844	Deer Creek	Shippenvilie	,,	66	36	1	8	...	Water	3	1,100
do.	...	...	1	1844	Black Fox	Brady's Bend	,,	66	40	1	8, 6	...	Steam	3	1,350
do.	...	1	...	1841	Clinton	Clinton Furnace	,,	56	36	1	8	...	Water	3	1,100
do.	...	1	...	1845	Licking	Licking	,,	52	35	1	7, 6	...	,,	3	1,000
do.	...	1	...	1845	Monroe	Clarion	,,	72	38	1	8	...	,,	2, 3	1,100
do.	...	...	1	1845	Limestone	Greenville	,,	58	33	1	8	...	,,	3	1,100
do.	...	1	...	1838	Jefferson	Jefferson furnace	,,	83	58	2	9	...	W. & S.	3	1,400
do.	...	1	...	1842	Buchanan	Callansburg	,,	86	61	2	9	...	Steam	3	1,400
do.	...	1	...	1845	Pike	Curlsville	,,	77	53	1	8, 6	...	,,	3	1,350
do.	...	1	...	1846	Eagle	Callansburg	,,	58	47	1	8	...	,,	3	1,100
do.	...	1	...	1846	Catfish	Brady's Bend	,,	75	48	1	9	...	,,	3	1,400
do.	...	1	...	1845	Sligo	Clarion	C. H.	75	40	1	8, 6	35	,,	3	1,560
do,	...	1	...	1836	Madison	,,	,,	75	40	1	8, 6	35	S. & W.	3	1,560
do.	...	1	...	1835	Beayer	Shippenville	C.	92	73	1	9	...	Steam	3	1,400
do.	...	1	...	1846	Washington	Clarion	,,	105	84	2	9	...	,,	3	1,420
do.	...	1	...	1847	Mount Pleasant	Strattonville	,,	62	45	1	8, 6	...	,,	3	1,350
do.	...	1	...	1845	Hemlock	Clinton	,,	69	43	1	8, 6	...	S. & W.	3	1,350
do.	...	...	1	1843	Franklin	Reimersburg	,,	67	50	1	8	...	Steam	3	1,100
do.	...	1	...	1846	Richland	Emlington	,,	70	56	1	9	...	,,	3	1,400
Erie	1	...	1	1842	Erie	Erie	B.	50	50	1	7	30	Water	1, 2	900
Fayette	5	1	...	1796	Fair Chance	Uniontown	C.	48	25	1	9	36	S. & W.	2, 3	1,400
do.	...	1	...	1820	Cool Spring*	,,	,,	30	15	1	7	33	Water	3	900
do.	...	...	1	1835	Wharton	,,	,,	60	42	1	8	33	S. & W.	2, 3	1,100
do.	...	...	1	1805	Spring Hill	Spring Hill	,,	50	28	1	8	33	,,	2, 3	1,100
do.	...	1	...	1796	Union	Connelsville	,,	55	28	1	8	33	Water	2, 3	1,100
Indiana	2	...	1	1847	Buena Vista	Armagh	,,	61	30	1	8	30	,,	3	1,100
do.	...	...	...	1847	Loop	Smixburg	,,	50	25	2	9	33	,,	3	1,400
Lawrence	1	...	1	1844	Martha	New Castle	,,	75	30	2	8	36	,,	2, 3	1,100
Mercer	3	...	1	1837	Springfield	Leesburg	,,	41	20	2	7	32	,,	1, 2	900
do.	...	...	1	1845	Oregon	Mercer	,,	50	25	2	8, 6	37	Steam	3	1,350
do.	...	...	1	1846	Iron City	,,	,,	75	40	2	8, 6	34	,,	2, 3	1,350
Somerset	2	...	1	1847	Somerset	Johnstown	C. H.	80	50	1	8, 6	30	Water	3	1,350
do.	...	...	1	1844	Rock	Stoystown	C.	43	15	1	6	21	,,	2	700
Venango	18	...	1	1843	Bullion Run	Franklin	,,	58	38	1	8	...	,,	3	1,100
do.	...	...	1	1830	Venango	Phipps' Mills	,,	70	50	1	8	...	,,	3	1,200
do.	...	...	1	1843	Annandale	Hendersonville	,,	53	46	1	8	...	Steam	3	1,100
do.	...	1	...	1847	President	President furnace	,,	50	25	1	8	...	Water	2, 3	1,100
do.	...	1	...	1835	Mill Creek	Mill Creek	,,	62	46	1	7, 6	...	,,	3	1,000
do.	...	1	...	1832	Van Buren	Franklin	C. B.	57	50	1	7, 6	...	,,	3	1,000
do.	...	1	...	1832	Clay	,,	C.	50	35	1	8	...	,,	3	1,100
do.	...	1	...	1834	Slab	,,	,,	50	30	1	8, 6	30	,,	3	1,350
do.	...	...	1	1844	Victoria	,,	,,	46	33	1	8, 6	...	,,	3	1,350
do.	...	...	1	1844	North Bend	,,	,,	30	25	1	8, 6	...	,,	3	1,350
do.	...	...	1	1844	Union	,,	,,	42	31	1	8	...	,,	3	1,100
do.	...	...	1	1844	Texas	,,	,,	36	30	1	8, 6	...	,,	3	1,350
do.	...	...	1	1842	Liberty	Sugar Creek	,,	60	50	1	8	30	Steam	3	1,100
do.	...	...	1	1843	Reymilton	Franklin	,,	60	60	1	8	30	Water	3	1,100
do.	...	1	...	1839	Webster	Rockland	,,	65	58	1	8, 6	30	W. & S.	3	1,350
do.	...	1	...	1836	Sandy	Franklin	,,	53	32	1	8	...	Water	3	1,100
do.	...	1	...	1838	Jane	Clintonville	,,	57	38	1	8	...	,,	3	1,100
do.	...	...	1	1835	Jackson	Cass	,,	60	36	1	8, 6	...	,,	3	1,350
Westmoreland	4	1	...	1815	Ross	West Fairfield	F.	30	40	1	8	30	,,	1. 2	1,100
do.	...	1	...	1809	Washington	Laughlintown	,,	40	30	1	9	33	,,	2, 3	1,400
do.	...	...	1	1847	Ramsey	Kiskiminitis	H.	50	20	1	9	34	,,	3	1,400
do.	...	...	1	1846	Lockport	Lockport	,,	50	25	1	8	33	,,	3	1,100
Number of furnaces in blast		49													104,130
Number of furnaces out of blast			35												
Total Number of furnaces ...				84				5,353	3,520						

* Abandoned 1826, Rebuilt 1848.

APPENDIX O.—DETAILED STATEMENT OF ALL THE CHARCOAL FORGES IN WESTERN PENNSYLVANIA IN 1850.

COUNTY.	Kind of Power Employed.	Date of Construction.	NAME OF WORKS.	SITUATION. POST-OFFICE.	Number of Forge fires.	Number of Hammers.	Men and Boys Employed.	Horses, Mules, and Oxen, Employed.	Market.	Number of run out Fires.
Clarion	Water.	1833	Shippenville	Shippenville	2	1	16	4	Home.	1
Indiana...	„	1841	Indiana	Armagh	2	1	18	6	„	1
Somerset	„	1826	Shade	Stoystown	1	1	8	3	„	...
					5	3	42	13		2

APPENDIX P.—DETAILED STATEMENT OF ALL THE ROLLING MILLS IN WESTERN PENNSYLVANIA IN 1850.

COUNTY.	Date of Construction.	NAME OF WORKS.	SITUATION. POST-OFFICE.	Number of Puddling Furnaces.	Number of Heating Furnaces.	Number of Trains Rolls.	Number of Nail Machines.	CONSUMED.					Number of Furnaces running, 1850.		Men and Boys Employed.	Horses, Mules, and Oxen Employed.	Number and kind of Power Employed.	Number of run out Fires.	No. of Forge Fires.	Description of Iron made.	Remarks.
								Bituminous Coal.	Wood.	Pig.	Bloom.	Scrap.	Puddling.	Heating.							
								Bushels.	Cords.	Tons.	Tons.	Tons.									
Alleghany ...	1836	Pittsburg ...	Pittsburg ; ...	14	6	5	25	480,000	500	6,000	500	500	14	6	250	10	Steam	1	1	Bar, rod, hoop, sheet, boiler, nails, spikes.	... ...
„ ...	1824	Kensington ...	„ ...	11	5	5	14	360,000	...	5,000	500	200	11	5	160	10	„	1	...		... ...
„ ...	1835	Wayne	„ ...	11	6	4	16	300,000	...	4,500	300	100	11	6	150	10	„	1	...		... ...
„	1845	Lippincott ...	„ ...	9	7	4	14	300,000	...	4,700	250	150	9	7	150	4	„	1	...		... ...
„ ...	1825	Sligo	„ ...	6	9	4	13	320,000	...	2,650	3,870	300	6	7	156	8	„	1	...		Enlarged, 1837.
„ ...	1823	Juniata	„ ...	14	12	5	50	410,000	...	5,000	1,000	1,000	14	10	295	18	„	1	...		„ 1845.
„ ...	1628	Ætna	„ ...	11	8	4	25	300,000	...	4,500	500	200	10	5	150	24	„	1	...		„ 1838.
„ ...	1840	Hecla	„ ...	11	5	3	15	300,000	...	5,000	100	...	11	5	160	26	„	1	...		... ...
„ ...	1849	Eagle	„ ...	10	5	4	31	200,000	...	2,800	...	...	10	5	108	4	„	1	...		... ...
„ ...	1846	Clinton	„ ...	10	6	4	11	177,300	...	2,566	60	...	10	6	102	6	„	1	...		... ...
„ ...	1828	Juniata	Alleghany City	9	4	4	13	300,000	...	4,000	500	300	8	4	125	6	„	1	...		... ...
„ ...	1845	Vesuvius... ...	Pittsburg ...	9	6	4	19	260,000	...	3,000	50	50	8	5	120	8	„	1	...		Running half time.
„ ...	1849	Pennsylvania ...	„ ...	2	3	2	...	75,000	400	50	50	100	2	3	35	4	„	...	1	Rods, shafts, anchors, axles ...	... ...
„ ...	1849	Sheffield	„ ...	2	6	2	...	150,000	...	600	1,200	200	2	6	80	3	„	...	...	„ „ ...	... ...
„ ...	1844	Duquesne ...	„ ...	...	4	4	...	120,000	...	...	1,000	1,200	...	4	80	4	„	...	...	Boiler and sheet iron and sheet steel.	... ...
„ ...	1845	Pittsburg Steel ...	„ ...	...	3	1	...	100,000	...	...	900	450	...	2	50	2	„	...	...	Bar and sheet steel and iron ...	... ...
Armstrong ...	1841	Brady's Bend ...	Brady's Bend...	26	10	2	...	672,000	...	9,000	...	...	20	4	200	20	„	1	...	Rails	Running half time.
„ ...	1848	Kittanning ...	Kittanning ...	10	5	4	12	360,000	...	3,300	...	...	8	5	150	5	„	1	1	Bar, rod, sheet, plate, hoops, and nails.	
Fayette ...	1834	Fairchance ...	Uniontown ...	2	3	3	6	100,000	...	900	...	40	2	3	60	12	„	1	2		
„ ...	1842	Brownsville ...	Brownsville ...	4	4	3	10	150,000	...	2,000	50	50	4	3	75	10	„	1	...		„ „
Lawrence ...	1842	Cossallo	New Castle ...	8	4	3	25	150,000	...	3,000	...	200	8	4	130	200	„	2	...		
...	1847	Orizaba	„ ...	4	4	3	21	160,000	...	3,200	...	100	8	4	130	200	„	1	...		
Venango, ...	1844	Franklin... ...	Franklin ...	4	2	3	10	120,000	...	1,500	...	60	4	3	104	12	Water	...	...		
				187	128	80	330	5,864,300	900	73,266	10,830	5,200	180	112	3,010	601		19	5		

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NEW YORK INDUSTRIAL EXHIBITION.

Special Report of PROFESSOR WILSON

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